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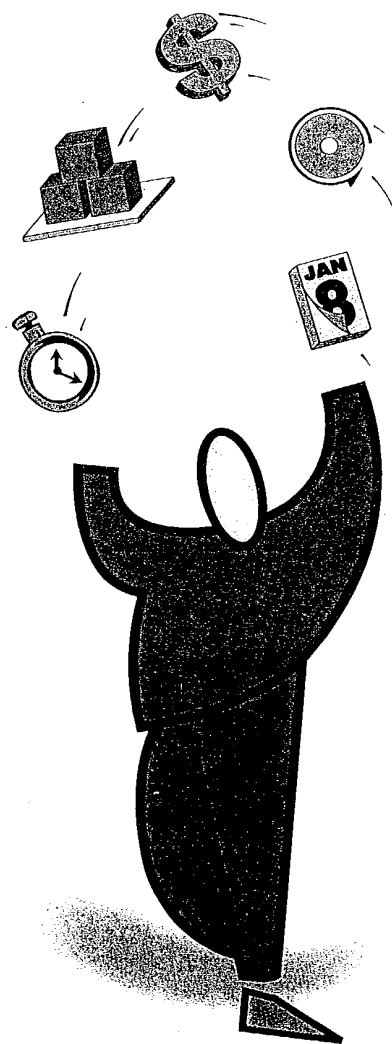
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# Rhythm<sup>®</sup>

Intelligent Planning and Scheduling Systems



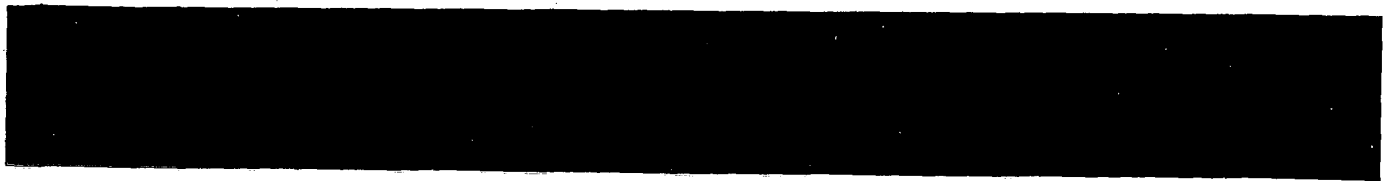
Rhythm Record Manual

*i*  
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# Rhythm®Record Manual

i2 Technologies, Inc. (formerly Intellection, Inc.)

Release 2.8 J - Jan 31, 1996



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## Chapter 1

# Introduction

This manual describes the set of all possible ASCII **data files** that may be input to and output from *Rhythm*<sup>®</sup>. Customers will input a subset of these files, and a subset of the fields within each file. These subsets are defined by a **spec\_file**. There are different **spec\_files** for each industry, and many customers further customize it to their own needs. **spec\_files** are described in the *Rhythm*<sup>®</sup> *User Manual*.

## Chapter 2

# Rhythm Data Files

Information is input to and output from *Rhythm*® through **data files**. A **data file** consists of a series of **data records**, which each consist of a series of **data fields**. A **data field** contains a single piece of information (such as a time, a quantity, or an identifier). A **data record** collects together multiple pieces of information about a particular entity in the **factory** (such as a **resource**, a **part**, a **routing**, or an **order**). For instance, a **data record** that specifies the information about a resource may consist of **data fields** including the `resource_id`, the `location_id`, and information about how to model it such as setup rules and times, maintenance rules and times, and so on.

A **data record** is terminated by an ASCII *newline*, or *end-of-file*. A **data field** is terminated by an ASCII *tab* character, *newline*, or *end-of-file*. The set of delimiters between fields is settable with the `file.delimiters` option, which defaults to *tab*. This can be over-ridden on a file-by-file basis in the spec-file (See the *Rhythm*® *User Manual*).

Records beginning with the following characters are ignored:

- Pound-sign “#” (043, 35, 0x23) indicates a comment line.
- Carriage Return (Control-M, 015, 13, 0x0D) [i.e. empty lines]
- NewLine (Control-J, 012, 10, 0x0A)
- NUL (Control-@, 00, 0, 0x00)
- SUB (Control-Z, 032, 26, 0x1A)

MS-DOS terminates lines with CarriageReturn/NewLine pairs. The NewLine at the end will be ignored. DOS also terminates files with one or more Control-Z characters. These are ignored also.

### 2.1 Field Names

Each piece of data used, displayed, or generated by *Rhythm*® software has a particular **field name**. The **field name** is used to specify the meaning of information in a **data field** (both in **data files** and **data editors**). As such, the **field name** is used in the column titles in **data editors**. All of the **field names** defined by *Rhythm*® are listed alphabetically in the *Rhythm*® *Record Manual* with a definition of what the field means, the **field type**, related **data fields**, the **record type** in which it is defined, and the **record types** in which it is used.



## 2.2 Field Types

Data fields may not contain *tabs*<sup>1</sup> (which terminate **data fields**) or *newlines* (which terminate both **data fields** and **data records**). Any other ASCII character may appear in a **data field**<sup>2</sup>. How those ASCII characters are interpreted by *Rhythm*® depends upon the **field type** of the **data field**, as described in the remainder of this section.

<b>char</b>	A single character. Trailing blanks are ignored.																																
<b>Integer</b>	A whole decimal number (positive or negative). Blank or null inputs translate to zero. Leading and trailing blanks are ignored. Trailing non-numeric characters default to being ignored, but will produce error messages if the <b>strict_conversion</b> option is turned on.																																
<b>number</b>	A real number. May be negative. Decimal point is optional. Scientific notation is accepted, using <b>Fortran</b> conventions. Blank or null inputs translate to zero. Leading and trailing blanks are ignored. Trailing non-numeric characters default to being ignored, but will produce error messages if the <b>strict_conversion</b> option is turned on.																																
<b>Name</b>	An arbitrary set of characters used to name something. Leading and trailing blanks are ignored. Names may be as long or short as you wish.																																
<b>Time_Format</b>	<p>All <b>Time</b> and <b>Date</b> fields require a format specification. <i>Rhythm</i>® format specifications are character strings, where special formatting characters are substituted with the corresponding time elements. All other characters will be part of the resulting time string.</p> <p>Example: specification = "When: Ww \_D MMM YYYY, hh:mmap"                                    result = "When: Su 1 SEP 1991, 07:23pm"</p> <p>The special formatting characters are:</p> <table> <tr><td><b>tt</b></td><td>Hour in 12 hour format, leading zero</td></tr> <tr><td><b>_t</b></td><td>Hour in 12 hour format, no leading zero</td></tr> <tr><td><b>hh</b></td><td>Hour in 24 hour format, leading zero</td></tr> <tr><td><b>_h</b></td><td>Hour in 24 hour format, no leading zero</td></tr> <tr><td><b>mm</b></td><td>Minute, leading zero</td></tr> <tr><td><b>_m</b></td><td>Minute, no leading zero</td></tr> <tr><td><b>ss</b></td><td>Second, leading zero</td></tr> <tr><td><b>_s</b></td><td>Second, no leading zero</td></tr> <tr><td><b>AP</b></td><td>AM/PM flag, uppercase</td></tr> <tr><td><b>ap</b></td><td>AM/PM flag, lowercase</td></tr> <tr><td><b>zzz</b></td><td>time zone abbreviation</td></tr> <tr><td><b>DD</b></td><td>Day of month, leading zero</td></tr> <tr><td><b>_D</b></td><td>Day of month, no leading zero</td></tr> <tr><td><b>MM</b></td><td>Month of year, leading zero</td></tr> <tr><td><b>_M</b></td><td>Month of year, no leading zero</td></tr> <tr><td><b>MMM</b></td><td>Month Abbreviation, all caps</td></tr> </table>	<b>tt</b>	Hour in 12 hour format, leading zero	<b>_t</b>	Hour in 12 hour format, no leading zero	<b>hh</b>	Hour in 24 hour format, leading zero	<b>_h</b>	Hour in 24 hour format, no leading zero	<b>mm</b>	Minute, leading zero	<b>_m</b>	Minute, no leading zero	<b>ss</b>	Second, leading zero	<b>_s</b>	Second, no leading zero	<b>AP</b>	AM/PM flag, uppercase	<b>ap</b>	AM/PM flag, lowercase	<b>zzz</b>	time zone abbreviation	<b>DD</b>	Day of month, leading zero	<b>_D</b>	Day of month, no leading zero	<b>MM</b>	Month of year, leading zero	<b>_M</b>	Month of year, no leading zero	<b>MMM</b>	Month Abbreviation, all caps
<b>tt</b>	Hour in 12 hour format, leading zero																																
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<sup>1</sup>The field separator defaults to *tab*, but can be changed. See the *Rhythm*® User Manual.

<sup>2</sup>If a field value begins with the pound-sign "#", and the field is the first field in the record, the record will be interpreted as a comment. To avoid this, put one or more spaces before the "#".

<b>Mmm</b>	Month Abbreviation, capitalized
<b>mmm</b>	Month Abbreviation, lowercase
<b>MR</b>	Rounded Month of year, leading zero (month rounded up when day not displayed and day of month is greater than 21)
<b>_R</b>	Rounded Month of year, no leading zero (month rounded up when day not displayed and day of month is greater than 21)
<b>MMR</b>	Rounded Month Abbreviation, all caps
<b>Mmr</b>	Rounded Month Abbreviation, capitalized
<b>mmr</b>	Rounded Month Abbreviation, lowercase
<b>YY</b>	Year mod 100
<b>YYYY</b>	Year
<b>WW</b>	2 character Day of week abbreviation, all caps
<b>Ww</b>	2 character Day of week abbreviation, Capitalized
<b>ww</b>	2 character Day of week abbreviation, lowercase
<b>WWW</b>	3 character Day of week abbreviation, all caps
<b>Www</b>	3 character Day of week abbreviation, Capitalized
<b>www</b>	3 character Day of week abbreviation, lowercase

**Formatted\_Time** A date and/or time input according to a **Time\_Format**. The default format is **DDMMYYYYhhmmss** (e.g. 25MAR1993183000 is March 25th 1993 at 6:30pm) The default may be changed via the **file.time\_format** option. In addition, each **Formatted\_Time** field has an associated **Time\_Format** field which can be used to specify the format.

## 2.3 Field Classes

Many **data** fields have common meanings. This is encapsulated in the field **Class**. For example, all **data** fields which may be either true or false are in the *Boolean* class.

## 2.4 Req Field

The **Req** field contains one of the following keys that indicates whether or not the field is required.

<b>Blank</b>	Blank indicates an optional field.
<b>P</b>	It is a primary key, and therefore required.
<b>U</b>	It has no default value (uninitialized and is therefore required).
<b>n</b>	Positive numbers indicate secondary key fields.
<b>-n</b>	Negative numbers indicate fields which require the corresponding (positive) secondary field.

The fields with positive numbers are optional, but if they occur, then the fields with the same positive number are required. A field with a negative number may NOT be included unless its corresponding positively numbered field is included.

Example from **Supplier\_Part\_Record**:



Req	Comments
P	Required
P	Required
1	Optional, but required if lead_time is used
1	Optional, but required if lead_time_uom is used
2	Optional, but required if cost_uom is used
-2	Optional
	Optional

## Chapter 3

### Field Classes

<b>ACM_Flag</b>	Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or " ". <i>Blank</i> and nothing at all default to <i>Add</i> .
<b>Aggregate_Resource</b>	A grouping of resources for displaying aggregate workloads.
<b>Batch_Capacity</b>	A number describing the capacity or some aspect of capacity of a batching resource.
<b>Batch_Type</b>	An identifier for orders which can be combined into the same runtime batch. An operation of a routing can have up to four <i>Batch_Types</i> (see <i>Batch_Type_Record</i> ).
<b>Boolean</b>	A single character field. True is one of the characters "1" "T" "t" "Y" or "y". False is one of the characters "0" "F" "f" "N" or "n". The set of <i>TRUE</i> characters is settable with the <i>boolean.true</i> default. The set of <i>FALSE</i> characters is settable with the <i>boolean.false</i> default.
<b>Boolean_Or_Blank</b>	A single character field. True is one of the characters "1" "T" "t" "Y" or "y". False is one of the characters "0" "F" "f" "N" or "n". A blank or empty value defaults to <i>FALSE</i> . The set of <i>TRUE</i> characters is settable with the <i>boolean.true</i> default. The set of <i>FALSE</i> characters is settable with the <i>boolean.false</i> default.
<b>Calendar_Time</b>	Date and Time.
<b>Customer</b>	An entity requiring the parts of zero or more <i>Demand_Orders</i> .
<b>Demand_Area</b>	The Market, or source of demand for a product. Can be a factory, warehouse, customer, etc.
<b>Demand_Order</b>	A demand of some quantity of parts for a customer by a given due date.
<b>ECN_CODE</b>	ECN Code: A single character field. One of "A" (Add), "D" (Delete), "U" (use Up), "R" (Replacement) This field may be empty (Null)
<b>Formatted_Time</b>	The format of a date/time string. The format is usually defaulted from the <i>file.time_format</i> default.
<b>Integer</b>	An integer number.
<b>Inventory_Buffer</b>	A location used to maintain inventory. Buffers currently have no size limits.

<b>Location</b>	The location of one or more Resources. Transportation times established between the various locations contribute to the planned lead times between operations of each routing. In the user interface, resources are organized by location for convenience.
<b>Manufacturing_Order</b>	A routing (sequence of operations) planned to build some quantity of a part. The parts output by a manufacturing are fed as input to another manufacturing order or (in the case of final assembly) shipped to a customer. Manufacturing orders thus feed the requirements of demand orders. Each manufacturing order has a routing, a set of input and output parts specified in the bill of materials, and planned start times for each operation in the routing.
<b>Material_UOM</b>	A unit of measure used to scale Part_Quantity. The default is a one-to-one conversion.
<b>Money</b>	Cost. Usually accompanied by a Unit_Of_Measure.
<b>Name</b>	String used to identify an object.
<b>Part_Number</b>	The name of a raw or manufactured part.
<b>Part_Quantity</b>	An amount of material (number of parts).
<b>Percentage</b>	Float from 0.0 to 1.0
<b>Planning_Granularity</b>	CAO Planning granularity. Use <i>P</i> for Planner, or <i>S</i> for Scheduler.
<b>Procurement_Inc_Lot_Size</b>	Not yet documented.
<b>Procurement_Max_Lot_Size</b>	Not yet documented.
<b>Procurement_Min_Lot_Size</b>	Not yet documented.
<b>Pruned_String</b>	Character string. Leading and trailing white-space is ignored.
<b>Resource</b>	A machine, workcenter, tool, workcrew, fixture, or any capacity-limited resource utilized by one or more operations.
<b>Resource_Usage</b>	One of "machine" "aux1" "aux2" or "operators". The strings are case insensitive.
<b>Routing</b>	The name of a sequence of operations.
<b>SD_Setup_Type</b>	An type or category of operations which appears in a Setup_Matrix describing the sequence dependent setup times when changing a resource from processing one SD_Setup_Type to another.
<b>Scalar_Time</b>	A time duration associated with a Unit_Of_Measure field.
<b>Setup_Matrix</b>	A matrix of SD_Setup_Types whose values are the sequence dependent setup times when changing a resource having the matrix from processing one SD_Setup_Type to another.
<b>Space</b>	Storage space. Usually accompanied by a Unit_Of_Measure.
<b>Starting_Point</b>	CAO starting point. One of <i>PST_FRESH</i> , <i>EPST_FRESH</i> , <i>PST_SIMULATION</i> or <i>EPST_SIMULATION</i> .
<b>String</b>	Character string.
<b>Sub_Resource</b>	A Resource which is a member of an Aggregate_Resource.
<b>Time_Format</b>	Format for reading and writing dates and times

<b>Time_String</b>	Formatted date/time string. The format is usually specified by the <code>file.time_format</code> default.
<b>Unit_Of_Measure</b>	A Unit Of Measure specifies a conversion from some external unit to the internal units used by Rhythm. For example, Rhythm stores all times as seconds. The <i>days</i> unit of measure converts days to seconds, while the <i>hours</i> unit of measure converts hours to seconds. The default (blank) unit of measure multiplies all values by one.
<b>Unsigned</b>	A positive integer number.
<b>Vendor_Max_Quantity</b>	The maximum quantity a vendor can supply within a particular lead-time.
<b>Vendor_Part</b>	A part number or the string <i>ALL_RAW_MATERIALS</i> . <i>ALL_RAW_MATERIALS</i> refers to all raw parts in the bill of materials. Anything else is interpreted as an individual part.
<b>char</b>	A single character.
<b>clockTy</b>	Time in seconds since January 1, 1901.
<b>number</b>	A number, either integer or floating-point (with or without decimal point).

## Chapter 4

# Record Types

### 4.1 Aggregate\_Resource\_Record

This file associates Sub\_Resources with an id (the Aggregate\_Resource) for the purpose of displaying overall load of aggregate resources. There is one record for each Sub\_Resource associated with an aggregate resource. A given Sub\_Resource can only have one aggregate resource.

This file is readable.

Aggregate_Resource_Record				
Field	Req	Class	Type	Default
aggregate_resource	P	Aggregate_Resource	Name	-Required-
sub_resource	P	Sub_Resource	Name	-Required-

**aggregate\_resource** A unique identifier used to represent a group of aggregate resources.  
The name of the aggregate resource must be defined in a file containing records of *Resource\_Record*.

**sub\_resource** The name of a resource defined in a file containing records of  
*Resource\_Record*.

## Chapter 4

# Record Types

### 4.1 Aggregate\_Resource\_Record

This file associates Sub\_Resources with an id (the Aggregate\_Resource) for the purpose of displaying overall load of aggregate resources. There is one record for each Sub\_Resource associated with an aggregate resource. A given Sub\_Resource can only have one aggregate resource.

This file is readable.

Aggregate_Resource_Record				
Field	Req	Class	Type	Default
aggregate_resource	P	Aggregate_Resource	Name	-Required-
sub_resource	P	Sub_Resource	Name	-Required-

**aggregate\_resource** A unique identifier used to represent a group of aggregate resources.  
The name of the aggregate resource must be defined in a file containing records of *Resource\_Record*.

**sub\_resource** The name of a resource defined in a file containing records of *Resource\_Record*.



## 4.2 Anchor Record

Each record specifies a constraining resource in the factory that should be load balanced in the automatic optimization functions.

This file is readable.

Anchor_Record				
Field	Req	Class	Type	Default
resource	P	Resource	Name	-Required-
balancing_algorithm	P	Name	Name	-Required-
ideal_utilization_level		number	number	1.0
min_utilization_level		number	number	0.0

**balancing\_algorithm** The method of balancing to be used at this resource is specified by balancing-type. The current methods available are:  
 SIMULATION: this method uses a *mini-simulation* of the processing of the operations available for this resource to generate a feasible sequence, based on the sequencing rules defined for the resource.  
 PULL-PUSH: this method uses the *CAO* algorithm to move operations to earlier time buckets (pull) or later time buckets (push), based on defined constraints.

**ideal\_utilization\_level** Defines a target utilization percentage that this resource should be limited to when doing the balancing. NOTE :To specify 100% utilization user must specify 1.0 in this column, if user specifies 100 it will be equivalent to saying 1000% utilization.

**min\_utilization\_level** Defines min target utilization percentage that resource should achieve while balancing. Its value should be between max/ideal\_utilization\_level and zero. (NOTE : Not available in the current version)

**resource** Specifies the resource for which this data record applies.

### 4.3 Attributes\_Record

A control file that typically contains a single record. This record specifies default attributes for the data set (plan start-time, etc.).

This file is readable.

Attributes_Record				
Field	Req	Class	Type	Default
start_time_format		Time_Format	Time_Format	DDMMYYYYhhmmss
start_time	P	Formatted_Time	Formatted_Time	-Required-

**start\_time** Specifies the date and time that should be used as the *current time* for critical planning and scheduling calculations such as simulation and forward propagation of EPSTs.

**start\_time\_format** Format for reading and writing dates and times

## 4.4 Available\_Capacity\_Record

Records of this file define resource calendar information as entered in *Rhythm*. This file is generated and maintained only through *Rhythm*.

This file is readable.

Available_Capacity_Record				
Field	Req	Class	Type	Default
resource	U	Resource	Name	
start_time_cal_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
start_time_cal		Formatted_Time	Formatted_Time	Unknown_Time
end_time_cal_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
end_time_cal		Formatted_Time	Formatted_Time	Unknown_Time
value		Percentage	number	0

- end\_time\_cal** The format of a date/time string. The format is usually defaulted from the file.time\_format default.
- end\_time\_cal\_format** Date/time format to use for end\_time\_cal.
- resource** Name of resource having calendar information defined.
- start\_time\_cal** The starting date for this calendar information.
- start\_time\_cal\_format** Date/time format to use for start\_time\_cal.
- value** Percentage of total time available to resource that this interval\_type takes up.

## 4.5 Batch Definition Record

Records of this file describe batches created either manually or automatically through *Rhythm*. Collections of orders (either demand or manufacturing) can be grouped together. There will be one record for each manufacturing order associated with a particular batch.

This file is readable.

Batch Definition Record				
Field	Req	Class	Type	Default
batch_id		Batch.Task	Name	NULL
batch_type		Batch.Type	Name	NULL
demand_order_id		Name	Name	
mfg_order_id	P	Manufacturing_Order	Name	-Required-
resource		Resource	Name	NULL
operation_id	P	Name	Name	-Required-
quantity_uom		Material_UOM	Name	Material_Quantity_UOM
quantity	P	Part.Quantity	number	-Required-
acm_flag		ACM_Flag	char	ACM_Add

**acm\_flag** Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or ". Blank and nothing at all default to Add.

**batch\_id** A unique identifier for a batch. Rhythm appends the same prefix, as defined by the server default *batch\_id\_prefix*, to all batch ids. By default, the prefix is *B*, so batch\_id should be something like *B001*.

**batch\_type** The type of batch created. The batch types available are:  
 —batch type 1— Text for batch type 1.  
 —batch type 2— Text for batch type 1.  
 This field is currently not used.

**demand\_order\_id** This field is obsolete.

**mfg\_order\_id** The manufacturing order associated with the jobs being batched.

**operation\_id** The operation id where this manufacturing order is performed.

**quantity** The quantity of this manufacturing order. This field is currently unused.

**quantity\_uom** The Unit of Measure associated with quantity. This field is currently unused.

**resource** The resource for which this batch information applies.

## 4.6 Batch\_Size\_Record

The `batch_size` record type specifies which resources are batching resources. Each data record in this file assigns various constraints on the batch size of operations of a particular `Batch_Type` when run at a particular resource. *Rhythm* uses these constraints when forming orders into batches on the resource.

This file is readable.

Batch_Size_Record				
Field	Req	Class	Type	Default
type		Batch_Type	Name	0
resource	P	Resource	Name	-Required-
formula	P	Batch_Capacity_Formula	Name	-Required-
ideal_capacity	1	Part_Quantity	number	1
min_capacity		Part_Quantity	number	0
max_capacity		Part_Quantity	number	1
capacity_uom	-1	Unit_Of_Measure	Name	Material_Quantity_UOM
runtime_uom		Unit_Of_Measure	Name	BLANK_UOM
runtime		Scalar_Time	number	0
acm_flag		ACM_Flag	char	ACM_Add

- acm\_flag** Can be used to modify runtimes of existing `batch_types` at resources. Batch runtimes can vary over time so we can have a fixed `batch_size` file and another file to specify runtimes.
- capacity\_uom** The unit of measure in which *ideal\_capacity*, *min\_capacity*, and *max\_capacity* sizes are specified. If left blank, `Batch_Capacity` fields are interpreted as `Part_Quantity`.
- formula** The formula that controls use of *min\_capacity*, *max\_capacity*, and *ideal\_capacity* when *Rhythm* forms operations of this type at this resource into batches. The value of this field should be *Batch\_Capacity\_Formula* for the default formula. Other formulas can be used in combination with C++ customizations on top of the base *Rhythm* software.
- ideal\_capacity** The size that the automated batching logic tries to achieve for this batch type. Additionally, when planning operations at a batching resource before specific batches have been formed, the *ideal\_level* is used to estimate the expected load placed on the resource.
- max\_capacity** Specifies the maximum size constraint for batches of this type. The automated batch formation logic uses this in the generation of batches.
- min\_capacity** Specifies the minimum size constraint for batches of this type. The automated batch formation logic uses this in the generation of batches.
- resource** The batching resource for which the record specifies sizes.
- runtime** The run time that should be used for batches of this type regardless of the operation run times in the batch.
- runtime\_uom** The time unit of measure in which the batch *runtime* is specified.
- type** The type of batch for which the record specifies sizes. This allows different batch types to have different size constraints at the same resource. If `type` field is missing then it means that the capacity values

are for all types at the resource.



## 4.7 Batch\_Type\_Record

Each record of the file establishes the Batch\_Type(s) of one of the operations of a routing. Orders scheduled at this operation can be batched together if they have compatible Batch\_Types. Batch\_Types are defined in a file containing records of type Routing\_Record.

This file is readable.

Batch_Type_Record				
Field	Req	Class	Type	Default
routing	P	Name	Name	-Required-
operation	P	Name	Name	-Required-
preop_time_uom	1	Unit_Of_Measure	Name	BLANK_UOM
preop_time	1	Scalar_Time	number	0
unit_runtime_uom	2	Unit_Of_Measure	Name	BLANK_UOM
unit_runtime	2	Scalar_Time	number	0
run_rate_uom	3	Material_UOM	Name	Material_Quantity_UOM
run_rate_per	3	Unit_Of_Measure	Name	BLANK_UOM
run_rate	3	Part_Quantity	number	0
base_yield		Percentage	number	1.0
cooldown_time_uom	4	Unit_Of_Measure	Name	BLANK_UOM
cooldown_time	4	Scalar_Time	number	0
part_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
transfer_batch_quantity		Part_Quantity	number	MATERIAL_QUANTITY_UNINITIALIZED
sequence_dependent_setup_type		SD_Setup_Type	Name	0
primary	5	Batch_Type	Name	0
secondary1	-5	Batch_Type	Name	0
secondary2	-5	Batch_Type	Name	0
secondary3	-5	Batch_Type	Name	0
base_machine_resource		Resource	Name	NULL
priority		Integer	Integer	unknown.INT
acm_flag		ACM_Flag	char	ACM_Add
link_downstream_p		Boolean	char	FALSE

**acm\_flag** Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or ". Blank and nothing at all default to Add.

**base\_machine\_resource** If this routing uses a single resource, you can specify it here. This is a convenience feature so some customers can avoid the more general *operation\_resources\_data* file.

**base\_yield** Defines the expected yield of this operation. If there is an expected spoilage of 3%, then *base\_yield* would be "0.97".

**cooldown\_time** Specifies the time material sits after runtime. The amount of time is independent of the quantity of parts.

**cooldown\_time\_uom** The units used for *cooldown\_time*.

**link\_downstream\_p** The link\_downstream\_p field indicates if this operation is linked to the following operation in this routing. If this value is *TRUE* then Rhythm will always propagate the planned times to the following operation to prevent any time gap between the two operations.

<b>part_quantity_uom</b>	The Unit of Measure associated with <i>material_quantity</i> .
<b>operation</b>	An operation in the operation sequence for <i>routing</i> .
<b>primary</b>	The primary batch type for this operation.
<b>priority</b>	This allows users to give priority to a particular routing and operation. CAO will use it in pull-push logic.
<b>routing</b>	The name of a routing which includes this <i>operation</i> . This routing id will be used by records of <i>Bill_Of_Materials_Records</i> to define where material is used when producing parts.
<b>run_rate</b>	Continuous flow processes use <i>run_rate</i> INSTEAD OF <i>unit_runtime</i> . <i>run_rate</i> is in terms of quantity / time. For example, 39 Tons per hour, or 19 liters per minute. The unit of measure (e.g. Tons or Liters) is specified with <i>run_rate_uom</i> field. The time unit of measure (e.g. hours or minutes) is in the <i>run_rate_per</i> field.
<b>run_rate_per</b>	A Unit of Measure associated with <i>run_rate</i> . E.g. in 19 liters per minute, this value would be "MINUTES".
<b>run_rate_uom</b>	A Unit of Measure associated with <i>run_rate</i> . E.g in 19 liters per minute, this value would be "LITERS".
<b>secondary1</b>	An alternate batch type for this operation.
<b>secondary2</b>	An alternate batch type for this operation.
<b>secondary3</b>	An alternate batch type for this operation.
<b>sequence_dependent_setup_type</b>	The type this routing puts this resource into after performing this operation. For example, a painting machine may put this resource into a state of "WHITE" or "BLACK" which is used in a setup matrix to specify sequence dependent setup time from type "WHITE" to "BLACK" and vice versa. If no type is input, then the type is set to a concatenation of operation and part. This field has meaning only if a setup matrix has been established.
<b>transfer_batch_quantity</b>	Transfer batch quantity for the operation.
<b>preop_time</b>	The amount of time materials occupy the resource before runtime. The amount of time is independent of the quantity of parts. However, if there are no input parts, this amount of time is ignored.
<b>preop_time_uom</b>	The units used for <i>preop_time</i> .
<b>unit_runtime</b>	Specifies the runtime per unit of <i>consumed_part_number</i> specified in the file containing records of <i>Bill_Of_Materials_Record</i> . For instance, if operation "Assemble_Table" requires "8" "legs" and "2" "table_top" and <i>unit_runtime</i> and <i>unit_runtime_uom</i> are "1" "HOURS" to produce 2 tables, and we plan an order for three tables (12 legs and 3 table_tops), the total runtime of the operation is 1.5 hours.
<b>unit_runtime_uom</b>	the unit of measure for <i>unit_runtime</i> .



## 4.8 Bill Of Materials Record

Records of this file specify the bill of materials. A single bill-of-material (BOM) consists of a produced part and quantity, a set of consumed parts and quantities, and a routing. A BOM might have effectivity information as well, saying that it is valid at a given start date. Because there is one consumed part but potentially more than one input parts and routings, much of the information in this file will repeat.

Currently we assume that *consumed\_part\_number* is input (consumed) and *produced\_part\_number* is output (produced) at the first operation of the routing.

Optional fields *ecn\_code*, *ecn\_date*, and *ecn\_number* establish Date and Use Effectivity for a BOM. Date effectivity constrains *Rhythm* to use the BOM only if operation PSTs can fall between two time points, the BOM start time and BOM end time. Use Effectivity defines three sets of parts, all of which are consumed parts in the bill: Use-Up Parts, Accompanying Parts, and Replacement Parts. Note that multiple level Use-Up effectivity is not supported. When *Rhythm* runs out of Use-Up Parts, it starts using Replacement Parts instead of Use-Up and Accompanying Parts. Note that our definition of Use Effectivity does not require that PSTs of operations of a use-effective BOM come before PSTs of operations of its replacement BOM. Thus, the schedule may say to start using the *new part* before the *old part* is used up.

If date effectivity fields are used, this file needs to be sorted by increasing *ecn\_date*, blank *ecn\_date* before nonblank values, then by *ecn\_code*.

This file is readable.

Bill Of Materials Record				
Field	Req	Class	Type	Default
produced_part_number		Part_Number	Name	NULL
new_produced_part_number		Part_Number	Name	NULL
produced_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
produced_quantity	P	Part_Quantity	number	-Required-
routing	U	Routing	Name	
operation	-1	Name	Name	
operation_sequence_number	-1	Integer	Integer	unknown.LONG
consumed_part_number		Part_Number	Name	NULL
new_consumed_part_number		Part_Number	Name	NULL
consumed_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
consumed_quantity	P	Part_Quantity	number	-Required-
acm_flag		ACM_Flag	char	ACM_Add
ecn_code	2	ECN_CODE	char	ECN_CODE_Null
ecn_description	-2	String		
ecn_date_format	-2	Time_Format	Time_Format	DDMMYYYYhhmmss
ecn_date	-2	Formatted_Time	Formatted_Time	Unknown_Time
ecn_number	-2	String		
min_quantity		Part_Quantity	number	0
max_quantity		Part_Quantity	number	Infinity
multiple_quantity		Part_Quantity	number	0
quantity_constraint_type		Name	Name	FINISHED
flexible_min_quantity_p		Boolean	char	TRUE
mfg_consolidation_interval		number	number	0
min_fixed_shrinkage		number	number	0
min_percent_shrinkage		number	number	0
norm_fixed_shrinkage		number	number	0
norm_percent_shrinkage		number	number	0

<b>acm_flag</b>	Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or ". Blank and nothing at all default to Add.
<b>consumed_part_number</b>	One of possibly several parts consumed by this bill.
<b>consumed_quantity</b>	The quantity of <i>consumed_part_number</i> consumed for every <i>produced_quantity</i> of <i>produced_part_number</i> . For instance, for a routing building tables, the <i>produced_quantity</i> and <i>produced_part_number</i> are "1" and "Table", while the <i>consumed_quantity</i> and <i>consumed_part_number</i> values are "4", "Legs" and "1" and "TableTop".
<b>consumed_quantity_uom</b>	The Unit of Measure associated with <i>consumed_quantity</i> .
<b>ecn_code</b>	<p>If not blank, this field establishes that the <i>consumed_part_number</i> and <i>consumed_quantity</i> is qualified by date effectivity information (<i>ecn_date</i>) or use effectivity information (<i>ecn_number</i>). The <i>ecn_code</i> specifies how to apply the record:</p> <p>"A" (Add): The record applies to the version of the BOM starting at <i>ecn_date</i>. If the file contains a BOM with an earlier <i>ecn_date</i>, this BOM is a copy of it with the addition of the <i>consumed_part_number</i> and <i>consumed_quantity</i>. The copying feature eliminates the need to repeat every record of the bill for every date effective change. Otherwise, this BOM is the original BOM (but is still not effective until <i>ecn_date</i>). When <i>ecn_date</i> is blank, it represents <i>currently effective</i>.</p> <p>"D" (Delete): The record deletes the <i>consumed_part_number</i> from the BOM starting at <i>ecn_date</i>. The <i>consumed_part_number</i> is presumably a member of the previously effective BOM.</p> <p>"U" (Use-Up Part): The record directs <i>Rhythm</i> to replace any Use-Up and Accompanying Parts having this record's <i>ecn_number</i> with any Replacement Parts having this record's <i>ecn_number</i>. For instance, a given BOM might specify <i>ecn_number</i> "100" with Use-Up Parts "10" and "11", Accompanying Part "12", and Replacement Parts "13", "14", and "15". It could also specify <i>ecn_number</i> "101" with Use-Up Part "20", no Accompanying Parts, and Replacement Part "21". If <i>Rhythm</i> runs out of part "10", it replaces demand for "10", "11", and "12" with parts "13", "14", and "15". Later, if it runs out of part "20", it starts using "21" instead.</p> <p>"S" (Accompanying Part): The record adds <i>consumed_part_number</i> and <i>consumed_quantity</i> as an Accompanying Part for <i>ecn_number</i>. There must be at least one Use-Up Part and one Replacement Part, but Accompanying Part is optional.</p> <p>"T" (Replacement Part): The record adds <i>consumed_part_number</i> and <i>consumed_quantity</i> as a Replacement Part for <i>ecn_number</i>.</p>
<b>ecn_date</b>	The date and time on which this bill is effective. If blank, this bill is initially effective. Its effectivity ends only if there is another BOM with the same <i>produced_part_number</i> but with a later <i>ecn_date</i> . Thus, it is easy to provide a succession of date effectivity changes. First, place the earliest effective BOM records in the file. Then follow it with changes effective date "D1". Then follow that with changes effective date "D2", where "D1" < "D2". Each new <i>ecn_date</i> causes a copy of the BOM

records of the most recent *ecn\_date* (for the given *consumed\_part\_number* and *routing*), so only the net changes have to be included. The earliest effective BOM becomes ineffective at "D1". The "D1" BOM becomes ineffective at "D2". If there are no other *ecn\_date* entries for this *consumed\_part\_number* and *routing*, the "D2" BOM is effective to infinity.

<b>ecn_date_format</b>	Date/time format to use for <i>ecn_date</i> .
<b>ecn_description</b>	A description of this particular effectivity. This field is for UI display purposes only.
<b>ecn_number</b>	The tag which binds sets of Use-Up, Accompanying, and Replacement Parts (see <i>ecn_code</i> ). For a given <i>ecn_number</i> , its Use-Up and Accompanying Parts are replaced by the Replacement Parts.
<b>flexible_min_quantity_p</b>	When the producible quantity falls below <i>min_quantity</i> , if this is FALSE then we set the producible quantity to 0, otherwise we leave it alone.
<b>max_quantity</b>	The maximum quantity of <i>produced_part_number</i> Rhythm plans for manufacturing orders of this bill. See field <i>quantity_constraint_type</i> for more information.
<b>mfg_consolidation_interval</b>	When positive, this value specifies an override of the <i>-mfg_consolidation_interval</i> command line parameter for manufacturing orders of this bill. Its units are days. See the documentation on <i>-mfg_consolidation_interval</i> for more information.
<b>min_fixed_shrinkage</b>	Indicates a minimum fixed loss of the "consumed_material_type" per mfg-order. It only applies when the part comes, at least partially, from procurements or mfg-orders whose first operation is not yet complete.
<b>min_percent_shrinkage</b>	Indicates a minimum percent loss of the "consumed_material_type" per mfg-order. This is similar to a maximal yield for a given "consumed_material_type" where $\text{max\_yield} = (1 - 0.01 * \text{"min\_percent\_shrinkage"})$ but only applies to procurements and manufactured parts whose first operation is not yet complete.
<b>min_quantity</b>	The minimum quantity of <i>produced_part_number</i> Rhythm plans for manufacturing orders of this bill. See field <i>quantity_constraint_type</i> for more information.
<b>multiple_quantity</b>	When non-zero this field constrains the quantity of <i>produced_part_number</i> Rhythm plans for manufacturing orders to a multiple of <i>multiple_quantity</i> . See field <i>quantity_constraint_type</i> for more information.
<b>new_consumed_part_number</b>	One of possibly several parts consumed by this bill. The <i>new_</i> prefix makes file <i>part_number_data</i> unnecessary to include in the data set. If <i>part_number_data</i> is present, your <i>spec_file</i> should instead use data field <i>consumed_part_number</i> .
<b>new_produced_part_number</b>	The part produced by this bill. This value will repeat for every <i>new_consumed_part_number</i> . The <i>new_</i> prefix makes file <i>part_number_data</i> unnecessary to include in the data set. If <i>part_number_data</i> is present, your <i>spec_file</i> should instead use data field <i>produced_part_number</i> .
<b>norm_fixed_shrinkage</b>	Indicates an expected fixed loss of the "consumed_material_type" per

	mfg-order. It only applies when the part comes, at least partially, from procurements or mfg-orders whose first operation is not yet complete.
<b>norm_percent_shrinkage</b>	Indicates an expected percent loss of the "consumed_material_type" per mfg-order. This is similar to a yield for a given "consumed_material_type" where the yield would be $(1 - 0.01 * \text{"normal\_percent\_shrinkage"})$ but only applies to procurements and manufactured parts whose first operation is not yet complete.
<b>operation</b>	This field is obsolete.
<b>operation_sequence_number</b>	This field is currently not used.
<b>routing</b>	The routing used to produce <i>produced_part_number</i> . This value will repeat for every <i>consumed_part_number</i> . It is possible to establish more than one routing for sets of produced and consumed parts. For instance, routing1 and routing2 might both produce Part10. The consumed parts might differ for routing1 and routing2, or they might be the same. If they are the same, the <i>consumed_quantity</i> values might differ.
<b>produced_part_number</b>	The part produced by this bill. This value will repeat for every <i>consumed_part_number</i> . <i>produced_part_number</i> must be defined in a file of type <i>Part_Number_Record</i> .
<b>produced_quantity</b>	The quantity of part produced by this bill. Commonly, this value is 1. This value will repeat for every <i>consumed_part_number</i> .
<b>produced_quantity_uom</b>	The Unit of Measure associated with <i>produced_quantity</i> .
<b>quantity_constraint_type</b>	Specifies whether <i>min_quantity</i> , <i>max_quantity</i> , and <i>multiple_quantity</i> fields are in terms of started (pre-routing-yield) or finished (post-routing-yield) quantities. The field is either <i>FINISHED</i> or <i>STARTED</i> . For instance, if <i>routing</i> operations have a combined yield of 50% and <i>min_quantity</i> is 100, a <i>quantity_constraint_type</i> of <i>FINISHED</i> specifies that the minimum produced quantity is 100 and thus the first operation must start 200. Conversely, if <i>quantity_constraint_type</i> is <i>STARTED</i> , the first operation must start 100 and thus the minimum produced quantity is 50.

## 4.9 Block\_Formation\_Record

An alternative to the Cycle\_Calendar\_Record where the data specifies production rate and size. Time intervals are calculated, assuming the records are sequential starting at start\_time

This file is readable.

Block_Formation_Record				
Field	Req	Class	Type	Default
block_id	P	Integer	Integer	-Required-
cycle	P	Planning_Cycle	Name	-Required-
resource	P	Resource	Name	-Required-
block_size_uom	1	Material_UOM	Name	Material_Quantity_UOM
block_size	P	Part_Quantity	number	-Required-
rate_uom	-2	Material_UOM	Name	Material_Quantity_UOM
rate	2	Part_Quantity	number	-1
minimum_block_size_uom	-3	Material_UOM	Name	Material_Quantity_UOM
minimum_block_size	3	Part_Quantity	number	-1
start_time_format	-4	Time_Format	Time_Format	DDMMYYYYYhhmmss
start_time	4	Formatted_Time	Formatted_Time	Unknown_Time
end_time_format	-5	Time_Format	Time_Format	DDMMYYYYYhhmmss
end_time	5	Formatted_Time	Formatted_Time	Unknown_Time

**block\_id** Globally unique Block Identifier. A value of -1 means a unique number will be automatically generated.

**block\_size** The minimum amount of material allowed to be processed in this block.

**block\_size\_uom** Units used for *block\_size*.

**cycle** Unique identifier Planning Cycle.

**end\_time** The block end date/time (write-only field)

**end\_time\_format** Date/time format to use for end\_time (write-only field)

**minimum\_block\_size** The minimum amount of material allowed to be processed in this block. The -1 default means use the default specified in the Cycle\_Resource\_Record.

**minimum\_block\_size\_uom** Units used for *minimum\_block\_size*.

**rate** The rate of production for an amount of material processed per day. The -1 default means use the default specified in the Cycle\_Resource\_Record.

**rate\_uom** Units used for *rate*.

**resource** Name of resource having cycle time defined.

**start\_time** The block start date/time (write-only field)

**start\_time\_format** Date/time format to use for start\_time (write-only field)

## 4.10 CAO\_Parameters\_Record

A control file that typically contains a single record. This record specifies default attributes that control the behavior of the CAO algorithm, which focuses on constraint anchored optimization, in *Rhythm*.

This file is readable.

CAO_Parameters_Record				
Field	Req	Class	Type	Default
pst_rule		Name	Name	MIN_WIP
convergence_speed		Integer	Integer	4
max_balancing_limit		Integer	Integer	6
starting_condition		Starting_Point	Name	PST_SIMULATION
consider_resource_constraints		Boolean	char	TRUE
no_duedate_violation		Boolean	char	FALSE
priority_model		Name	Name	Duedate_Priority_Model
utilization_goal_p		Boolean	char	FALSE
run_utilization_fix_pass_p		Boolean	char	TRUE
propagate_after_moving_every_task		Boolean	char	FALSE
archive_plan		Boolean	char	FALSE
diffusion		Boolean	char	TRUE
look_ahead_uom	1	Unit_Of_Measure	Name	BLANK_UOM
look_ahead	1	Scalar_Time	number	0
resource_criticality		Name	Name	CRITICALITY_BASED

**archive\_plan** A single character field. True is one of the characters "1" "T" "t" "Y" or "y". False is one of the characters "0" "F" "f" "N" or "n". The set of *TRUE* characters is settable with the *boolean.true* default. The set of *FALSE* characters is settable with the *boolean.false* default.

**consider\_resource\_constraints** If this flag is TRUE it will consult the resource calendar and cycle calendar while propagating CEST/CLST constraints.

**convergence\_speed** CAO converges to solution. Convergence speed is a positive number indicating the how many times CAO will allow a task to be pulled during balancing. In this case, pull means any number of sequential settings of PST earlier followed by setting the PST earlier.

**diffusion** A single character field. True is one of the characters "1" "T" "t" "Y" or "y". False is one of the characters "0" "F" "f" "N" or "n". The set of *TRUE* characters is settable with the *boolean.true* default. The set of *FALSE* characters is settable with the *boolean.false* default.

**look\_ahead** The amount of time to look ahead when attempting to pull or push jobs.

**look\_ahead\_uom** The time unit of measure in which *look\_ahead* is specified.

**max\_balancing\_limit** The maximum number of times one resource will be balanced during the run of CAO.

**no\_duedate\_violation** If set to *TRUE*, CAO will not push the job beyond its LPST.

**priority\_model** This will specify the priority model used by CAO for pull/push criteria.

**propagate\_after\_moving\_every\_task** This field is obsolete in release 2.7.

<b>pst_rule</b>	<p>These rules specify how <i>CAO</i> sets the planned start time for those tasks which are moved by <i>CAO</i>. The available rules are:</p> <p><b>JIT:</b> The start times of tasks moved by <i>CAO</i> will be set to finish the tasks as on time as possible if the order is early or as early as possible if the order is late.</p> <p><b>MAX_UTIL_MIN_WIP:</b> This rule enforces maximum utilization while minimizing cycle time.</p> <p><b>MIN_WIP:</b> <i>CAO</i> will try to minimize the gap of the finished time of one operation and the start time of the next operation, i.e. minimize cycle time.</p> <p><b>OPTIMISTIC:</b> The start times of tasks moved by <i>CAO</i> will be set to finish the tasks as early as possible.</p>
<b>resource_criticality</b>	<p>A number representing how balancing this resource will effect the rest of the schedule. It should be related to the total number of jobs and resources that will potentially be affected during balancing.</p>
<b>run_utilization_fix_pass_p</b>	<p>A single character field. True is one of the characters "1" "T" "t" "Y" or "y". False is one of the characters "0" "F" "f" "N" or "n". The set of <i>TRUE</i> characters is settable with the <i>boolean.true</i> default. The set of <i>FALSE</i> characters is settable with the <i>boolean.false</i> default.</p>
<b>starting_condition</b>	<p>Specifies from which condition to begin <i>CAO</i>. It could be EPSE/PST. Available starting conditions are, <b>PST_FRESH</b> : Starts with PST and will also move scheduled tasks if it requires to. <b>PST_SIMULATION</b> : Starts with PST and will not pull/push scheduled tasks. <b>EPST_FRESH</b> : Starts with EPST and will also move scheduled tasks if it requires to. <b>EPST_SIMULATION</b>: Start with EPST and will not pull/push scheduled tasks.</p>
<b>utilization_goal_p</b>	<p>If set to <i>TRUE</i> it will use minimal propagation while running <i>CAO</i>. So it will only change <i>pst</i> of upstream or downstream tasks if it needs to.</p>

## 4.11 Cycle\_Calendar\_Record

Records of this file represent information entered and maintain via the *Rhythm* cycle calendar interface. Each record indicates a cycle is in effect for the specified time interval on the specified resource. It is possible to have multiple cycles in effect at the same time on a given resource. (See Cycle\_Resource\_Record)

This file is readable.

Cycle_Calendar_Record				
Field	Req	Class	Type	Default
cycle	P	Planning_Cycle	Name	-Required-
resource	P	Resource	Name	-Required-
start_time_cal_format	-1	Time_Format	Time_Format	DDMMMYYYYlthmmss
start_time_cal	1	Formatted_Time	Formatted_Time	Unknown_Time
end_time_cal_format	-1	Time_Format	Time_Format	DDMMMYYYYhhmmss
end_time_cal	1	Formatted_Time	Formatted_Time	Unknown_Time
start_time	2	clockTy	Unsigned	unknown.SECONDS
end_time	2	clockTy	Unsigned	unknown.SECONDS
interval_type		Name	Name	
description		String		NULL

- cycle** Unique identifier for making reference to a cycle.
- description** A textual description of the cycle.
- end\_time** Obsolete way to input start\_time, kept for compatibility with old data. Will be removed in a future version (after 2.2).
- end\_time\_cal** The end date for this cycle interval
- end\_time\_cal\_format** Date/time format to use for end\_time\_cal.
- interval\_type** Unused.
- resource** Name of resource having cycle time defined.
- start\_time** Obsolete way to input start\_time, kept for compatibility with old data. Will be removed in a future version (after 2.2).
- start\_time\_cal** The starting date for this cycle interval
- start\_time\_cal\_format** Date/time format to use for start\_time\_cal.



## 4.12 Cycle\_Resource\_Record

This data file specifies the cycles that a particular resource provides. Entries in this file are required in order to use the *Rhythm Cycle Calendar* interface to specify the time intervals for the cycles. Use the *Cycle\_Routing\_Record* file to restrict which routing operations may be performed during the resource's cycle. Several fields in this record apply to a specific cycle regardless of the resource: *setup\_time*, *default\_rate*, and *default\_minimum\_block\_size*. Thus last record for a specific cycle will override any earlier values for these fields from a previous record referencing the same cycle.

This file is readable.

Cycle_Resource_Record				
Field	Req	Class	Type	Default
cycle	P	Planning_Cycle	Name	-Required-
resource	P	Resource	Name	-Required-
setup_time_uom	-1	Unit_Of_Measure	Name	BLANK_UOM
setup_time	1	Scalar_Time	number	0
default_rate_uom	-2	Material_UOM	Name	Material_Quantity_UOM
default_rate	2	Part_Quantity	number	-1
default_minimum_block_size_uom	-3	Material_UOM	Name	Material_Quantity_UOM
default_minimum_block_size	3	Part_Quantity	number	-1
use_block_planning		Boolean	char	FALSE
acm_flag		ACM_Flag	char	ACM_Add

**acm\_flag** Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or ". Blank and nothing at all default to Add.

**cycle** Unique identifier to reference a particular cycle.

**default\_minimum\_block\_size** The minimum amount of material allowed to be processed. (Only used by the Block Formation Editor.) A value of -1 indicates the default minimum will be the actual block size specified by the Block\_Formation\_Record or interactively using the Block Formation Editor.

**default\_minimum\_block\_size\_uom** Units used for *default\_minimum\_block\_size*.

**default\_rate** The amount of material processed per day. (Only used by the Block Formation Editor.) The -1 default means use the global default value as specified in the server default: */-bfe\_default\_rate/*

**default\_rate\_uom** Units used for *default\_rate*.

**resource** The resource for which this cycle information applies.

**setup\_time** The amount of time required for setup of this resource for this cycle. If a task is requiring this cycle, the set up time is subtracted from the resource's capacity in the load graph bucket where the task begins. This setup time is only subtracted once per resource load graph bucket regardless of the number of planned tasks requiring this cycle.

**setup\_time\_uom** Units used for *setup\_time*.

**use\_block\_planning** Causes tasks on this resource to be planned with the start time at the beginning of the containing block. The downstream task is constrained after the end of the containing block. The resource must have

/Block\_Formation\_Record/ entries. If any record sets this to TRUE, that resource will use block planning regardless of other values in other records.

### 4.13 Cycle\_Routing\_Record

A record in this data file defines which cycle to use for a particular routing operation. Tasks for operations in this file will only be planned on resources providing the same cycle as specified in the *Cycle\_Resource\_Record*. Furthermore, the task must be planned during the cycle's time interval specified in the *Cycle\_Calendar\_Record*.

This file is readable.

Cycle_Routing_Record				
Field	Req	Class	Type	Default
routing	P	Routing	Name	-Required-
operation	P	Name	Name	-Required-
cycle	P	Planning_Cycle	Name	-Required-

**cycle** Name of the cycle.

**operation** Particular operation within a routing for which this cycle information applies.

**routing** Name of the routing which includes this operation.

## 4.14 Demand\_Order\_Record

These records describe the demand orders to be filled by the factory. Each data record in this data file defines a request (demand order) for a quantity of some product along with a due date, priority, etc.

This file is readable.

Demand_Order_Record				
Field	Req	Class	Type	Default
demand_order_id	P	Name	Name	-Required-
sales_due_date_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
sales_due_date	P	Formatted_Time	Formatted_Time	-Required-
part_number		Part_Number	Name	NULL
new_part_number		Part_Number	Name	NULL
part_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
part_quantity	P	Part_Quantity	number	-Required-
priority		number	number	unknown.FLOAT
category		Pruned_String	Pruned_String	
customer		Customer	Name	NULL
demand_area		Demand_Area	Name	NULL
replan_order_p		Boolean	char	FALSE
ship_early		Boolean	char	FALSE
crsd_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
crsd		Formatted_Time	Formatted_Time	Unknown_Time
promise_date_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
promise_date		Formatted_Time	Formatted_Time	Unknown_Time
ship_partial		Boolean	char	FALSE
make_to_stock_p		Boolean	char	UNKNOWN_BOOLEAN
stock_buffer		Inventory_Buffer	Name	unspecified_inventory_buffer_id
acm_flag		ACM_Flag	char	ACM_Add

**acm\_flag** Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or "". *Blank* and nothing at all default to *Add*.

**category** The type of this order. This is used to create logical groupings of the orders.

**crsd** Customer Requested Ship Date: Orders with the ship\_early flag False are displayed in the ship\_early problem\_window pane if they complete too much before CRSD, "Too much" is determined by the pane's tolerance.

**crsd\_format** The date/time format to use in parsing *crsd*.

**customer** This field identifies the requestor (customer) that placed this order.

**demand\_area** The plant (production location) that should be assigned to produce this order.

**make\_to\_stock\_p** A flag specifying whether this order is to be made regardless of inventory. A value of "T" means always build this part, while "F" means take it from stock if possible, build it otherwise. The default value is the value of the demand order part's stock\_part\_p flag, which

	itself defaults "F".
<b>part_quantity</b>	The quantity of the end product ( <i>part_number</i> or <i>new_part_number</i> ) that this order requires.
<b>part_quantity_uom</b>	The unit of measure in which <i>part_quantity</i> is specified.
<b>part_number</b>	The end product to be produced for this order. Use <i>part_number</i> in the spec_file when warnings should be generated upon encountering a previously undefined part number. (i.e. not listed in the file containing records of Part_Number_Record.) This type should not be used when <i>new_part_number</i> is used.
<b>new_part_number</b>	The end product to be produced for this order. Use <i>new_part_number</i> in the spec_file when warnings should not be generated upon encountering a previously undefined part number. Use this instead of the <i>part_number</i> field when there is no part master provided. (i.e there is no file containing records of Part_Number_Record.) This type should not be used when <i>part_number</i> is used.
<b>demand_order_id</b>	A unique identifier which will identify this particular demand order.
<b>priority</b>	The priority or importance associated with this order. The priority is used by the automatic planning algorithms in <i>Rhythm</i> to compare the importance of one order relative to other orders. The higher the number, the greater the priority.
<b>promise_date</b>	Date promised to customer.
<b>promise_date_format</b>	The date/time format to use in parsing <i>promise_date</i> .
<b>replan_order_p</b>	A flag specifying whether or not the saved plan for this order should be ignored, thus forcing a new default plan to be generated. A value of "T" means the order should be forced to replan, while "F" means the saved plan should be restored and used, if possible.
<b>sales_due_date</b>	The date by which the customer was promised that the product could be produced. This is the date <i>Rhythm</i> tries to meet in its automatic planning algorithms.
<b>sales_due_date_format</b>	The date/time format to use in parsing <i>sales_due_date</i> .
<b>ship_early</b>	A flag specifying whether this order is a problem if it is ready too early. A value of "T" means earliness is a problem, while "F" (the default) means it isn't. Too early means more than some tolerance from the <i>crsd</i> , see that field.
<b>ship_partial</b>	A flag specifying whether this order is a problem if it is ready too early. A value of "T" means partial shipments are allowed, while "F" (the default) means they aren't.
<b>stock_buffer</b>	The inventory buffer destination for a part built for a demand order with <i>make_to_stock</i> = "T". If <i>make_to_stock_p</i> is "F" this field is ignored.

## 4.15 Dispatch\_List\_Record

This record supports writing of dispatch list information. User can specify format through spec file and use this record to write schedules at a particular resource or at all resources. Currently the record supports some of the important attributes of scheduled jobs but it should finally support all the fields supported in the schedule list of manual scheduler.

This file is readable.

Dispatch_List_Record				
Field	Req	Class	Type	Default
resource	U	Resource	Name	
next_resource		Resource	Name	NULL
part_number	U	Part_Number	Name	
operation_id		Name	Name	NULL
quantity	U	Part_Quantity	number	
runtime_uom		Unit_Of_Measure	Name	BLANK_UOM
runtime		Scalar_Time	number	0
formatted_runtime		Pruned_String	Pruned_String	
pst_format		Time_Format	Time_Format	DDMMYYYYYYhhmmss
pst		Formatted_Time	Formatted_Time	Unknown_Time
schedule_end_time_format		Time_Format	Time_Format	DDMMYYYYYYhhmmss
schedule_end_time		Formatted_Time	Formatted_Time	Unknown_Time
lpst_format		Time_Format	Time_Format	DDMMYYYYYYhhmmss
lpst		Formatted_Time	Formatted_Time	Unknown_Time
customer	U	Customer	Name	
due_date_format		Time_Format	Time_Format	DDMMYYYYYYhhmmss
due_date		Formatted_Time	Formatted_Time	Unknown_Time
order_id		Name	Name	NULL
batch_id		Name	Name	NULL

**batch\_id** It the batch id of the batch, which this scheduled job belongs to.

**customer** This field is ignored on input. When command line option mfg\_consolidation\_horizon is zero, each operation has only one demand order, and the demand orders customer is written in this field. Otherwise each operation has potentially many demand orders, so a blank is written.

**due\_date** This field is ignored on input. When command line option mfg\_consolidation\_horizon is zero, each operation has only one demand order, and the demand orders due date is written in this field. Otherwise each operation has potentially many demand orders, and the earliest due date among the demand orders is written.

**due\_date\_format** Time format for the demand order due date.

**formatted\_runtime** Runtime of the scheduled operation broken down into components: Days:Hours:Minutes:Seconds.

**lpst** It the latest possible start time that this job should have started to meet the order due date. It is the operation due date.

**lpst\_format** LPST time format.

<b>next_resource</b>	This information indicates, where is this job to go after this operation is completed.
<b>operation_id</b>	The operation within a routing.
<b>order_id</b>	It is the manufacturing order id to which this scheduled job belongs to.
<b>part_number</b>	Part produced by this manufacturing order.
<b>pst</b>	Start time of the scheduled operation.
<b>pst_format</b>	Time format for printing start time of the scheduled operation.
<b>quantity</b>	It is the quantity produced by this scheduled operation.
<b>resource</b>	It is the work center at which this scheduled operation will be performed.
<b>runtime</b>	Runtime of the scheduled operation.
<b>runtime_uom</b>	The time unit of measure in which the batch <i>runtime</i> is specified.
<b>schedule_end_time</b>	End time of the scheduled operation.
<b>schedule_end_time_format</b>	Time format for printing end time of the scheduled operation.

## 4.16 Dispatch\_Rule\_Record

Records of this file are used to effect how CAO operates. The dispatching method for each resource and its accompanying arrival time is defined. The following dispatching algorithms are available:

**FIFO:**

Select the first job (from the Ready queue).

**SRPF:**

Select the job with shortest remaining process time. The remaining process time is the estimated critical path cycle time.

**MIN\_SETUP:**

Select the job with the same setup type as the previous job. If none exists, then select the first job.

**FIX\_SIZE:**

Select the first job and, when the resource batch capacity allows, other jobs with the same batch type.

**ANCHOR\_FIFO:**

Same as FIFO, except that when the Ready queue is empty, select the first job whose EPST is less than the simulator current time from the Waiting queue.

**ANCHOR\_SRPF:**

Select the job with the shortest remaining process time only if it is needed by other resources (i.e. constraint times not empty).

**ANCHOR\_MIN\_SETUP:**

Select a job with the same setup type as the previous job. If such a job can not be found in the Ready queue, search in the Waiting queue. The selected job from the Waiting queue should have EPST less than the simulator current time and PST no further than lookahead\_length from the simulator current time. If no job can be found, the first job from the Ready queue is selected.

The following are available for arrival time:

**BUCKET\_BASED:**

**CEST:**

Jobs will arrive at their CESTs.

**PST:**

Jobs will arrive at their PSTs.

This file is readable.

Dispatch_Rule_Record				
Field	Req	Class	Type	Default
resource	U	Resource	Name	
dispatching_algorithm		Name	Name	NULL
arrival_time		Name	Name	NULL

**arrival\_time** One of the above defined arrival times.

**dispatching\_algorithm** One of the above defined dispatching algorithms.

**resource** The resource having its dispatching algorithm defined.



### 4.17 Dynamic\_CAO\_Parameters\_Record

This file is read in before every run of *CAO*. It contains the parameters of *CAO* that can be changed between the runs of *CAO*. The file should specify the parameters that can change (or that the user wants to change) between two runs of *CAO*. The file is read before every run of *CAO*, while the *CAO\_Parameters* file is only read once at initialization. Ideally, a user should be able to change all the dynamic parameters through the UI, but many times an option is not added to the UI until later. If the UI allowed changes of all the parameters in the *Dynamic\_CAO\_Parameters* file, then that file would not be added.

This file is readable.

Dynamic_CAO_Parameters_Record				
Field	Req	Class	Type	Default
priority_model		Name	Name	<i>DueDate_Priority_Model</i>
run_utilization_fix_pass_p	P	Boolean	char	-Required-
propagate_after_moving_every_task	P	Boolean	char	-Required-
archive_plan	P	Boolean	char	-Required-
diffusion	P	Boolean	char	-Required-
resource_criticality	P	Name	Name	-Required-
iterations		Integer	Integer	2.0

**archive\_plan** If TRUE, *Rhythm* will archive the plan before the run of *CAO*. User will be able to *Undo CAO* if archive\_plan flag is set to TRUE. More over when user runs *CAO* multiple times, *Rhythm* will always first undo the *CAO* go back to the archived plan. In cases where this flag is set to FALSE *CAO* will start on the current plan and if user wants to *Undo CAO* s/he needs to generate plan again. For larger data sets it is advised to set this flag to FALSE.

**diffusion** If set to TRUE, *CAO* will use diffusion based balancer else it will use look ahead based balancer. For detail information on *diffusion*, or look ahead based balancer, refer to the *Rhythm User Manual*.

**iterations** If *CAO* is using user defined search path then this field will specify the number of iterations *CAO* will go over that search path.

**priority\_model** This will specify the priority model used by *CAO* for pull/push criteria.

**propagate\_after\_moving\_every\_task** This field is obsolete in release 2.7.

**resource\_criticality** A number representing how balancing this resource will effect the rest of the schedule. It should be related to the total number of jobs and resources that will potentially be affected during balancing.

**run\_utilization\_fix\_pass\_p** If TRUE, *CAO* will run second pass at the end to fix remaining capacity shortage problems. While running second pass *CAO* will relax the constraints and allow balancer to create WIP. User can set this flag through command line and by default its TRUE.

## 4.18 Fixed\_Capacity\_Bucket\_Size\_Record

This record allows the definition of a number of fixed-length bucket sizes used for rough scheduling purposes and many graphical display elements (e.g. load graphs). The overall scheduling horizon cannot be affected by this record.

This record is a sub-set of what can be defined by records of *Variable\_Capacity\_Bucket\_Size\_Record*.

This file is readable.

Fixed_Capacity_Bucket_Size_Record				
Field	Req	Class	Type	Default
bucket_size_uom	P	Unit_Of_Measure	Name	-Required-
bucket_size	P	Scalar_Time	number	-Required-

**bucket\_size** The size of the bucket. For example given a *bucket\_size* of "1", and a *bucket\_size\_uom* of "WEEKS", the size of each bucket will be one week.

**bucket\_size\_uom** The time units used for *bucket\_size*.

## 4.19 Interplant\_Demand\_Keys\_Record

This file is readable.

Interplant_Demand_Keys_Record				
Field	Req	Class	Type	Default
demanding_order	P	Name	Name	-Required-
operation		Name	Name	NULL
consumer	P	Name	Name	-Required-
part	P	Name	Name	-Required-

- consumer** The plant in the Interplant network demanding *part* from the supplier. The possible names are established by *Supplier\_Record* s. *Consumer* is treated as the customer field of the generated Interplant demand order.
- demanding\_order** The demand order or manufacturing order of *consumer* needing *part*.
- operation** If Blank this field indicates that *demanding\_order* is a demand order of *consumer*. Otherwise *demanding\_order* is a manufacturing order of *consumer*, and this field is the first operation of the manufacturing order. Note that *Rhythm* does not yet allow reservations for operations other than the first one in the routing.
- part** The part required by *demanding\_order* from the supplier. The supplier's name for the part is used in this field if it differs from this *Rhythm* server's name for it. Differences in part names between *Rhythm* servers in an Interplant network are expressed using the *vendor\_part* field of *Vendor\_Record*.

## 4.20 Interplant\_Order\_Record

This file is maintained by *Rhythm* for use in saving and restoring demand orders which fill Interplant demands. Interplant plants supplying parts to other plants save the demand orders generated.

This file is readable.

Interplant_Order_Record				
Field	Req	Class	Type	Default
demanding_order	P	Name	Name	-Required-
operation		Name	Name	NULL
consumer	P	Name	Name	-Required-
part	P	Name	Name	-Required-
supplying_order	P	Demand_Order	Name	-Required-

- consumer** The plant in the Interplant network demanding *part* from the supplier. The possible names are established by *Supplier\_Record* s. *Consumer* is treated as the customer field of the generated Interplant demand order.
- demanding\_order** The demand order or manufacturing order of *consumer* needing *part*.
- operation** If Blank this field indicates that *demanding\_order* is a demand order of *consumer*. Otherwise *demanding\_order* is a manufacturing order of *consumer*, and this field is the first operation of the manufacturing order. Note that *Rhythm* does not yet allow reservations for operations other than the first one in the routing.
- part** The part required by *demanding\_order* from the supplier. The supplier's name for the part is used in this field if it differs from this *Rhythm* server's name for it. Differences in part names between *Rhythm* servers in an Interplant network are expressed using the *vendor-part* field of *Vendor\_Record*.
- supplying\_order** the demand order of this Interplant supplier plant which was generated in response to an Interplant demand from some consumer plant (through an *Interplant\_Procurement\_Record*). Depending on option settings, the supplying\_order id is either a generated id the same as *demanding\_order*.

## 4.21 Interplant\_Procurement\_Record

Files of this type are maintained by *Rhythm* for use in saving and reading Interplant demands and responses. *interplant\_data\_PLANTNAME* is a template, not a data file. The actual data files are named *interplant\_data\_* concatenated with a plant name established by *Supplier\_Record*.

Using this record, Interplant demands are issued by one *Rhythm* server (the consumer) to communicate demand for a part to another *Rhythm* server (the supplier). An Interplant response is issued by the supplier back to the consumer, communicating how many parts can be supplied and at what time they are estimated to be available.

This file is readable.

Interplant_Procurement_Record				
Field	Req	Class	Type	Default
demanding_order	P	Name	Name	-Required-
operation		Name	Name	NULL
consumer	P	Name	Name	-Required-
part	P	Name	Name	-Required-
is_demand_p	P	Boolean	char	-Required-
time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
time	P	Formatted_Time	Formatted_Time	-Required-
quantity_uom		Material_UOM	Name	Material.Quantity_UOM
quantity	P	Part_Quantity	number	-Required-
priority		number	number	unknown.FLOAT
supplier	P	Name	Name	-Required-

- consumer** The plant in the Interplant network demanding *part* from the supplier. The possible names are established by *Supplier\_Record*s. *Consumer* is treated as the customer field of the generated Interplant demand order.
- demanding\_order** The demand order or manufacturing order of *consumer* needing *part*.
- is\_demand\_p** If TRUE, this record describes an Interplant demand order for *part* from *supplier* requested by *consumer*. If FALSE, this record describes the response to such a demand by *supplier* to *consumer*. The response tells when the parts can be supplied and how many can be supplied.
- operation** If Blank this field indicates that *demanding\_order* is a demand order of *consumer*. Otherwise *demanding\_order* is a manufacturing order of *consumer*, and this field is the first operation of the manufacturing order. Note that *Rhythm* does not yet allow reservations for operations other than the first one in the routing.
- part** The part required by *demanding\_order* from the supplier. The supplier's name for the part is used in this field if it differs from this *Rhythm* server's name for it. Differences in part names between *Rhythm* servers in an Interplant network are expressed using the *vendor-part* field of *Vendor\_Record*.
- priority** If *is\_demand\_p* is TRUE, this number is the priority *consumer* requests *supplier* to set for the demand order which will supply *part*. Otherwise, this field is ignored.
- quantity** The quantity of *part* demanded when *is\_demand\_p* is TRUE, else the quantity of *part* supplied by *supplier* via *supplying\_order*.

<b>quantity_uom</b>	The Unit of Measure associated with the <i>quantity</i> field.
<b>supplier</b>	The plant in the Interplant network supplying <i>part</i> to <i>consumer</i> . The possible names are established by <i>Supplier_Record</i> s.
<b>time</b>	If <i>is_demand_p</i> is TRUE, this is the time that <i>demanding_order</i> needs <i>part</i> . Otherwise it is the time parts are available from <i>supplying_order</i> .
<b>time_format</b>	Date/time format to use for the <i>time</i> field.

## 4.22 Inventory\_Buffer\_Record

Each record of the file specifies the *location* for an *inventory\_buffer*. The location is used to account for the transportation time between the inventory buffers and other locations in the factory model.

This is an optional file.

This file is readable.

Inventory_Buffer_Record				
Field	Req	Class	Type	Default
inventory_buffer	P	Inventory_Buffer	Name	-Required-
location		Location	Name	Location::unspecified()

**inventory\_buffer** A unique identifier naming the particular inventory buffer whose location is being defined.

**location** The location of this inventory buffer.

### 4.23 Lot Reassignment Record

Used to keep track of separate quantities of material processed at an operation, such as coils in the metals industry. This file is written out by Rhythm, primarily in order to keep track of the results of splitting orders by lots.

A lot reassignment record tells where the lot is (manufacturing order only). This information is written out by Rhythm. The point is to keep track of the location of lots which, because of a split, are no longer where the lot record says they are.

When Rhythm starts up, the lot data is read first and the lots are placed accordingly. Then the lot reassignment data is read. At this time, if a lot has been assigned to order A but belongs to order B according to the lot reassignment data, then the lot will be moved from A to B, but only if order B is the result of a split from lot A, or A and B were both split from the same order.

This file is readable.

Lot Reassignment Record				
Field	Req	Class	Type	Default
manufacturing_order	P	Name	Name	-Required-
lot_id		Name	Name	NULL

**lot\_id** Identifier for this lot

**manufacturing\_order** The unique manufacturing order id used to associate this lot with a particular demand order.



## 4.24 Lot\_Record

Used to keep track of separate quantities of material processed at an operation, such as coils in the metals industry. A lot record tells where the lot is (manufacturing order and operation) and what is the quantity of material in the lot. This information is supplied by the user. If `lot_on_remaining_ops` is `TRUE`, then the user will also see the lot at all operations downstream from the one where it really is.

This file is readable.

Lot_Record				
Field	Req	Class	Type	Default
<code>manufacturing_order</code>		Name	Name	NULL
<code>current_operation</code>		Name	Name	NULL
<code>lot_on_remaining_ops</code>		Boolean	char	FALSE
<code>lot_id</code>	P	Name	Name	-Required-
<code>lot_qty</code>	U	Part Quantity	number	

- `current_operation`** The operation for this lot within a particular routing.
- `lot_id`** Identifier for this lot
- `lot_on_remaining_ops`** If true, lot is also placed on all tasks downstream of this one, but this task is the actual location of the lot.
- `lot_qty`** Quantity of material in this lot.
- `manufacturing_order`** The unique manufacturing order id used to associate this lot with a particular demand order.

<b>operation</b>	An operation of <i>routing</i> (if present). Helps specify which material is loaded on <i>resource</i> (see Cases #1 and #4 above).
<b>operation_start_time</b>	NOTE: this field is currently not supported. The time at which material loaded on <i>resource</i> started being processed. If blank we assume that it is being started at <i>current time</i> .
<b>produced_part</b>	Helps specify which material is loaded on <i>resource</i> (see Case #4 above).
<b>resource</b>	The resource whose state is described by this record.
<b>routing</b>	Helps specify which material is loaded on <i>resource</i> (see Case #4 above).
<b>start_time_format</b>	Date/time format to use for <i>operation_start_time</i> .

## 4.26 Make\_To\_Stock\_Record

Records of this file describe the most recent action of *Repopulate Stock Buffers*. There will be one record for each make\_to\_stock demand order that gets more than zero of its part made.

This file is readable.

Make_To_Stock_Record				
Field	Req	Class	Type	Default
producing_order	P	Name	Name	-Required-
inventory_buffer		Inventory_Buffer	Name	unspecified_inventory_buffer_id
part_number	P	Part_Number	Name	-Required-
quantity	P	number	number	-Required-
arrival_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
arrival_time	P	Formatted_Time	Formatted_Time	-Required-

- arrival\_time** The time at which this part will be available in *inventory\_buffer*.
- arrival\_time\_format** The date/time format to use in parsing *arrival\_time*.
- inventory\_buffer** The holding queue in which this part is sitting. If left blank it defaults to the buffer specified by command line option *-unspecified\_inventory\_buffer\_id*.
- part\_number** The part number for the quantity of parts that are being specified.
- producing\_order** An identifier specifying with the make to stock demand order.
- quantity** The amount of the part produced.

## 4.27 Manufacturing\_Order\_Pegging\_Record

This file associates demand orders with their final assembly manufacturing orders, and manufacturing orders with their subassembly manufacturing orders. A demand order can be fed parts by zero or one manufacturing order, and a manufacturing order can be fed parts by zero or more manufacturing orders. (Other part requirements are met from unassigned inventory or vendors.)

This file is typically written only by *Rhythm*. It is read by *Rhythm* to restore previous plans.

This file is readable.

Manufacturing_Order_Pegging_Record				
Field	Req	Class	Type	Default
produced_order	P	Name	Name	-Required-
demand_order_p		Boolean	char	FALSE
consumed_order	P	Name	Name	-Required-
quantity_fed		number	number	0
acm_flag		ACM_Flag	char	ACM_Add

**acm\_flag** Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or ". Blank and nothing at all default to Add.

**consumed\_order** A manufacturing order which feeds parts to produced\_order.

**demand\_order\_p** A flag specifying whether *produced\_order* is a demand order or manufacturing order.

**produced\_order** An identifier specifying either a demand order or manufacturing order.

**quantity\_fed** Quantity of material transfered from sub\_project to project.

## 4.28 Manufacturing\_Order\_Record

This file specifies all manufacturing orders and associated data. Each final assembly and sub-assembly is a manufacturing order.

The association between demand order and its final assembly manufacturing order, and between a manufacturing order and its associated sub-assembly manufacturing orders is maintained in the file containing records of *Manufacturing\_Order\_Pegging\_Record*.

This file is readable.

Manufacturing_Order_Record				
Field	Req	Class	Type	Default
manufacturing_order	P	Name	Name	-Required-
routing	P	Routing	Name	-Required-
specific_routing_id	P	Part_Number	Name	-Required-
order_quantity_satisfied		number	number	0
split_quantity		number	number	0
mfg_plant_id		Name	Name	0
acm_flag		ACM_Flag	char	ACM_Add
ecn_date_format		Time_Format	Time_Format	DDMMYYYYhhmmss
ecn_date		Formatted_Time	Formatted_Time	Unknown_Time

**acm\_flag** Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or ". *Blank* and nothing at all default to *Add*.

**ecn\_date** Routing date effectivity.

**ecn\_date\_format** Date/time format to use for ecn\_date

**manufacturing\_order** The unique id used to represent a particular manufacturing order.

**mfg\_plant\_id** Name of plant where this MFG order will be/is being produced.

**order\_quantity\_satisfied** Quantity of the demand order this order satisfies.

**routing** The routing where this order will be performed.

**specific\_routing\_id** Determines specific Routing. Usually a bill of material is identified by a routing and the BOM produced part. Therefore, this field is usually the BOM produced part number.

**split\_quantity** Quantity of an order that is to be split off to make a new order.

## 4.29 Mfg\_Order\_Output\_Record

This file specifies the format in which the manufacturing orders planned by *Rhythm* are output. See *Manufacturing\_Order\_Record* for more information about manufacturing orders.

This file is readable.

Mfg_Order_Output_Record				
Field	Req	Class	Type	Default
mfg_order		Name	Name	NULL
routing	U	Routing	Name	
primary_output_part	U	Part_Number	Name	
output_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
output_quantity	U	Part_Quantity	number	
whole_output_quantity		Integer	Integer	0
status		Pruned_String	Pruned_String	
pst_format		Time_Format	Time_Format	DDMMMYYYYhhmmss
pst		Formatted_Time	Formatted_Time	Unknown_Time
pet_format		Time_Format	Time_Format	DDMMMYYYYhhmmss
pet		Formatted_Time	Formatted_Time	Unknown_Time
demand_order	U	Demand_Order	Name	
within_mfg_consolidation_horizon		Boolean	char	FALSE

**demand\_order** A demand of some quantity of parts for a customer by a given due date.

**mfg\_order** A unique id used to identify a particular manufacturing order.

**output\_quantity** The quantity of parts in units of *output\_quantity\_uom* produced by this manufacturing order.

**output\_quantity\_uom** The Unit of Measure associated with output\_quantity

**pet** The Planned End Time of this manufacturing order.

**pet\_format** Date/time format to use for pet.

**primary\_output\_part** The part number being produced by this manufacturing order.

**pst** The Planned Start Time for this manufacturing order.

**pst\_format** Date/time format to use for pst.

**routing** The routing used to by this manufacturing order.

**status** The status of this manufacturing order.

**whole\_output\_quantity** output quantity rounded to a whole number

**within\_mfg\_consolidation\_horizon** Flag indicating whether this manufacturing order falls within the time specified by options -mfg\_consolidation\_horizon and -current\_time.

### 4.30 Monthly\_Production\_By\_Part\_Record

This file is written by *Rhythm* for use by the customer in writing production by part. Production based upon forecasts for the following months needs to be output from *Rhythm* for use in financial comparison reports to be generated. After a plan has been generated, the production for each PSF and / or table in each month is output to this file.

Every month, projected production needs to be analyzed to understand the anticipated plant performance and comparison to historical performance. Since this analysis is financial, the standard costs and accounting factors are applied based on part number, and hence, production numbers that are provided are broken into monthly part numbers (consolidated over the different lots run during the month).

The information that is acquired is the total quantity of product planned over the entire month, for each month of the plan. This requires a two step process. First, each planned completion date has only month and year information. After sorting by year, month, and part number, the orders with similar part ids falling in the same month are consolidated. By saving the plan, the file will be automatically generated.

This file is readable.

Monthly_Production_By_Part_Record				
Field	Req	Class	Type	Default
ordered_part	U	Part_Number	Name	
order_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
order_quantity	U	Part_Quantity	number	
time_produced_format		Time_Format	Time_Format	DDMMYYYYhhmmss
time_produced		Formatted_Time	Formatted_Time	Unknown_Time
start_of_bucket_format		Time_Format	Time_Format	DDMMYYYYhhmmss
start_of_bucket		Formatted_Time	Formatted_Time	Unknown_Time

- order\_quantity** An amount of material (number of parts). Always with a Unit\_Of\_Measure field.
- order\_quantity\_uom** The Unit of Measure associated with order\_quantity.
- ordered\_part** The part number being ordered for this demand order.
- start\_of\_bucket** The start of bucket for the procurement.
- start\_of\_bucket\_format** Date/time format to use for needed\_time
- time\_produced** The format of a date/time string. The format is usually defaulted from the file.time\_format default.
- time\_produced\_format** Date/time format to use for when part is produced.

### 4.31 Operation\_Operators\_Record

This file is obsolete and should no longer be used as of *Rhythm* 2.2

This file is readable.

Operation_Operators_Record				
Field	Req	Class	Type	Default
routing	P	Routing	Name	-Required-
operation	P	Name	Name	-Required-
operator_group	P	Resource	Name	-Required-
min_num_operators		Integer	Integer	1
max_num_operators		Integer	Integer	1
operator_dependent_p		Boolean	char	TRUE
usage_percent		Percentage	number	1

max\_num\_operators

min\_num\_operators

operation

operator\_dependent\_p

operator\_group

routing

usage\_percent



## 4.32 Operation\_Resources\_Record

This file is optional and is only appropriate for operations which require a combination of different types of resources (such as a machine, tool, and workcrew) to run. Some factory operations may require several resource types but have so much capacity at one of these types that, for convenience, it can be ignored and left out of the set. For instance, if the factory operations require machines and workcrews but workcrew capacity is abundant, this file is not required at all, since the file containing records of *Routing\_Record* is sufficient for establishing the machines (primary resources) which can run each operation.

It is entirely possible that only a few operations of the factory require records in this file, since they are the only operations which require multiple resources.

Each record of the file specifies one alternative resource for one of the required simultaneous resources. Each record has a type field which specifies which of the simultaneous resource requirements it models. It may be one of the following: "machine", "aux1", "aux2", or "operators". The four *factor* fields specify how those characteristics of the operation are affected by choosing one resource versus another. For instance, if one "machine" resource has an *op\_time\_factor* of "1", and another "machine" resource has an *op\_time\_factor* of "2", then performing the operation on the latter resource will take twice as long as on the former.

This file is readable.

Operation_Resources_Record				
Field	Req	Class	Type	Default
routing	P	Routing	Name	-Required-
operation	P	Name	Name	-Required-
simultaneous_usage	1	Resource_Usage	Resource_Usage	USAGE_MACHINE
resource	U	Resource	Name	
primary_p		Boolean	char	FALSE
preop_time_factor		number	number	1
runtime_factor		number	number	1
cooldown_time_factor		number	number	1
yield_factor		number	number	1
usage_percent		number	number	1
num_operators	-1	Integer	Integer	0

**cooldown\_time\_factor** Factor for cooldown time.

**num\_operators** Meaningful only if simultaneous\_usage is equal to "operators". The number of operators needed at this resource group.

**operation** The operation within the routing where this assignment applies.

**primary\_p** True if resource defined is the primary (first one picked by *Rhythm*).

**routing** The routing for which a simultaneous resource, alternate resource, or an operator resource is being defined.

**resource** The name of the resource for simultaneous or alternate usage.

**runtime\_factor** Factor for run time.

**simultaneous\_usage** The simultaneous group for which definition applies. Can be any of:  
 "machine" The primary group.  
 "aux1" A secondary resource requirement.  
 "aux2" An additional resource requirement.  
 "operators" An operator resource requirement.

**preop\_time\_factor** Factor for setup time.

**usage\_percent** How much of this resource's time is used relative to the primary resource.

**yield\_factor** Factor for yield.

### 4.33 Part\_Number\_Record

This file specifies various types of parts and materials present in the factory, including products produced and sold, purchased parts consumed in producing products, and consumable resources which drive production.

Each record specifies the attributes of a particular *part\_number*. *sellable?* is 1 or 0. If it is 1, *part\_number* is considered a product sold externally. Usually a sellable part is the output part of at least one record of *bill\_of\_materials\_data*. *Unit\_space* and *unit\_space\_uom* are used to calculate batch capacity of a resource relative to this part.

This file is readable.

Part_Number_Record				
Field	Req	Class	Type	Default
<i>part_number</i>	P	Part_Number	Name	-Required-
<i>demand_part_number</i>		Name	Name	NULL
<i>product_family</i>		Name	Name	
<i>part_number_type</i>		Name	Name	NULL
<i>customer_name</i>		Name	Name	NULL
<i>sellable_p</i>		Boolean	char	TRUE
<i>unit_price</i>	1	Money	number	0
<i>unit_price_uom</i>	-1	Unit_Of_Measure	Name	BLANK_UOM
<i>unit_cost</i>	6	Money	number	0
<i>unit_cost_uom</i>	6	Unit_Of_Measure	Name	BLANK_UOM
<i>unit_space_uom</i>	-2	Unit_Of_Measure	Name	BLANK_UOM
<i>unit_space</i>	2	Space	number	0
<i>quantity_per_unit_space</i>	-2	Part_Quantity	number	0.0
<i>description</i>		Name	Name	
<i>min_routing_time_uom</i>	3	Unit_Of_Measure	Name	BLANK_UOM
<i>min_routing_time</i>	3	Scalar_Time	number	0
<i>stock_buffer</i>		Inventory_Buffer	Name	unspecified_inventory_buffer_id
<i>stock_part_p</i>		Boolean	char	FALSE
<i>acm_flag</i>		ACM_Flag	char	ACM_Add

**acm\_flag** Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or ". Blank and nothing at all default to Add.

**customer\_name** In certain cases the name of the customer who might have caused this part to be in the dataset will be present. The reason for this field is that sometimes there are raw materials in inventory which are not used by any BOM. The excess inventory windows display the excess raw materials that are on hand for a particular customer. To associate a customer with these raw materials which have no connection to an order (which is where customer usually lives), the customer name field is needed for the part object. If not present this defaults to an empty string.

**demand\_part\_number** A catalog identifier used by demand orders to refer to this part. This identifier is the one used in the demand order to refer to this part. If left blank it defaults to *part\_number*.

**description** A description for the part.

<b>part_number</b>	The unique identifier for the part that is being specified.
<b>min_routing_time</b>	An estimate of the minimum time required to create any quantity of this part, given the required input parts. This is a generic lead time for the part. If the calculated production time is less than this number, this number is used instead.
<b>min_routing_time_uom</b>	The time unit of measure in which <i>min_routing_time</i> is specified.
<b>part_number_type</b>	Defines a category for the part. (e.g. Raw Material, Manufactured, etc.).
<b>product_family</b>	The product family this part belongs to.
<b>quantity_per_unit_space</b>	The quantity of this part that can be stored in one unit of space. This field is currently not used.
<b>sellable_p</b>	Indicates whether this part can be sold. It is possible to be both sellable and purchasable at the same time. When it is true, this part is considered a product, but it can still be used as input to a routing to produce other parts.
<b>stock_buffer</b>	The inventory buffer destination for a stock part. This provides a default value for make_to_stock demand orders' stock buffer.
<b>stock_part_p</b>	A flag specifying whether this part should always be taken from inventory for use as a component in parts which contain it, or could be built if there is insufficient inventory. A value of "T" means never build this part as a component, while "F" means take it from stock if possible, build it otherwise. The default value is "F".
<b>unit_cost</b>	Cost. Usually accompanied by a Unit Of Measure.
<b>unit_cost_uom</b>	A Unit Of Measure specifies a conversion from some external unit to the internal units used by Rhythm. For example, Rhythm stores all times as seconds. The <i>days</i> unit of measure converts days to seconds, while the <i>hours</i> unit of measure converts hours to seconds. The default (blank) unit of measure multiplies all values by one.
<b>unit_price</b>	The price for one unit (quantity of 1) of this part. This field is meaningless and we err on public references whenever <i>sellable_p</i> is false. This field is currently not used.
<b>unit_price_uom</b>	The money unit of measure in which <i>unit_price</i> is specified.
<b>unit_space</b>	The amount of space occupied by one unit (quantity of 1) of this part.
<b>unit_space_uom</b>	The space unit of measure in which <i>unit_space</i> is specified.

### 4.34 Plan\_Expedite\_Task\_Record

This file is maintained by *Rhythm* for use in saving and restoring plans. Records of this file specify manufacturing orders which have been expedited.

This file is readable.

Plan_Expedite_Task_Record				
Field	Req	Class	Type	Default
mfg_order_id		Name	Name	NULL
operation_id		Name	Name	NULL
cycle_override_p		Boolean	char	FALSE
move_time_override		number	number	0.0
queue_time_override		number	number	0.0
setup_time_override		number	number	0.0
run_time_override		number	number	0.0
wait_time_override		number	number	0.0
downstream_mfg_order		Manufacturing_Order	Name	NULL

**cycle\_override\_p** If this is TRUE, RHYTHM will ignore the the cycle/block constraints during planning.

**downstream\_mfg\_order** This field is blank if the operation is not the last operation of the routing. Otherwise this field gives the downstream manufacturing order for the given move\_time\_override. When manufacturing orders are consolidated, this information is critical since the operation will have a separate expeditable transportation time for each fed manufacturing order.

**mfg\_order\_id** The name of the manufacturing order which has been expedited.

**move\_time\_override** override value for move time for expedition.

**operation\_id** The operation of the routing for which this manufacturing order applies.

**queue\_time\_override** override value for queue time for expedition.

**run\_time\_override** override value for run time for expedition. Not Implemented Yet.

**setup\_time\_override** override value for setup time for expedition. Not Implemented Yet.

**wait\_time\_override** override value for wait time for expedition.

### 4.35 Plan Inventory Assignments Record

This file is maintained by *Rhythm* for use in saving and restoring plans. Records of this file specify how inventory has been assigned to demand orders and manufacturing orders.

This file is readable.

Plan Inventory Assignments Record				
Field	Req	Class	Type	Default
demand_or_mfg_order_id	P	Name	Name	-Required-
operation_id		Name	Name	NULL
assigned_part	P	Part Number	Name	-Required-
assigned_quantity_uom		Material UOM	Name	Material Quantity UOM
assigned_quantity	P	Part Quantity	number	-Required-
part_source		Name	Name	NULL
vendor_p		Boolean	char	FALSE
time_available_format		Time Format	Time Format	DDMMYYYYhhmmss
time_available	P	Formatted Time	Formatted Time	-Required-
time_needed_format		Time Format	Time Format	DDMMYYYYhhmmss
time_needed		Formatted Time	Formatted Time	Unknown Time
time_previously_reserved		Formatted Time	Formatted Time	Unknown Time
purchase_order_id		Name	Name	{unspecified}
part_number_type		Name	Name	

<b>assigned_part</b>	The part assigned to this order.
<b>assigned_quantity</b>	The quantity of parts assigned.
<b>assigned_quantity_uom</b>	The Unit of Measure associated with assigned_quantity.
<b>demand_or_mfg_order_id</b>	The demand or manufacturing order for this inventory assignment.
<b>operation_id</b>	The operation id of the order if the order id is a manufacturing order. If the operation_id is not present, then it is assumed that the material is for the first operation. If the assigned_part is not the same as the consumed material in the first operation, the record is ignored.
<b>part_number_type</b>	The type of assigned_part. This data is not used on input.
<b>part_source</b>	This is either an inventory buffer or vendor id. Specifies from where the material came.
<b>purchase_order_id</b>	If this is unassigned inventory, the purchase order associated with the inventory. If this is a procurement the field is meaningless.
<b>time_available</b>	The time inventory for this order is available from the part_source.
<b>time_available_format</b>	Date/time format to use for time_available.
<b>time_needed</b>	The time inventory for this order is needed. This time is the LPST of the operation or, for end item inventory assignments, the demand order due date. This data is not used on input, since LPST and due date can change.
<b>time_needed_format</b>	Date/time format to use for time_needed.
<b>time_previously_reserved</b>	The time this part was reserved.
<b>vendor_p</b>	Flag specifying whether order came from a vendor or not. "T" means <i>part_source</i> is a vendor,

"F" means inventory buffer.

### 4.36 Plan\_Record

This file is maintained by *Rhythm* for use in saving and restoring plans. It stores operation PSTs and other data. The default name for the actual file is `planned_start.times`. See the `std_spec_file` for a list of the fields here that are likely to actually be included in the data.

This file is readable.

Plan_Record				
Field	Req	Class	Type	Default
mfg_order_id		Name	Name	NULL
primary_resource		Resource	Name	NULL
operation_id	P	Name	Name	-Required-
operators	1	Resource	Name	NULL
priority		Integer	Integer	unknown.INT
num_operators	-1	Integer	Integer	0
planned_start_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
planned_start_time		Formatted_Time	Formatted_Time	Unknown_Time
planned_end_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
planned_end_time		Formatted_Time	Formatted_Time	Unknown_Time
planned_transit_ready_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
planned_transit_ready_time		Formatted_Time	Formatted_Time	Unknown_Time
epst_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
epst		Formatted_Time	Formatted_Time	Unknown_Time
lpst_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
lpst		Formatted_Time	Formatted_Time	Unknown_Time
clst_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
clst		Formatted_Time	Formatted_Time	Unknown_Time
cest_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
cest		Formatted_Time	Formatted_Time	Unknown_Time
lock_count		Integer	Integer	0
planned_input_qty_uom		Material_UOM	Name	Material_Quantity_UOM
planned_input_qty		Part_Quantity	number	0
planned_output_qty_uom		Material_UOM	Name	Material_Quantity_UOM
planned_output_qty		Part_Quantity	number	0
planned_runtime_uom		Unit_Of_Measure	Name	BLANK_UOM
planned_runtime		Scalar_Time	number	0
stretched_runtime		Scalar_Time	number	0
primary_output_part		Part_Number	Name	NULL

**cest** Constrained Earliest Start Time for this operation. This is calculated by forward propagation from the PST of the upstream operation. This field is output only.

**cest\_format** Date/time format to use for CEST.

**clst** Constrained Latest Start Time for this operation. This is calculated by backward propagation from the PST of the down stream operation. This field is output only.

**clst\_format** Date/time format to use for CLST.

**epst** Earliest Possible Start Time of this operation. This is constrained by



	parts availability, original plan starting date and completion of upstream operations.
<b>epst_format</b>	Date/time format to use for EPST.
<b>lock_count</b>	An integer number.
<b>lpst</b>	Latest Possible Start Time for this operation. This is constrained by backward propagation from the due date for a demand order.
<b>lpst_format</b>	Date/time format to use for LPST.
<b>mfg_order_id</b>	A unique identifier referring to a manufacturing order.
<b>num_operators</b>	The number of individual pooled operators assigned to this operation.
<b>operation_id</b>	An operation within the routing of this manufacturing order.
<b>operators</b>	The operators resource used for this operation.
<b>planned_end_time</b>	The planned (or scheduled) ending time for this operation.
<b>planned_end_time_format</b>	Date/time format to use for <i>planned_end_time</i> .
<b>planned_input_qty</b>	The planned quantity of input parts associated with the operation.
<b>planned_input_qty_uom</b>	The Unit of Measure associated with <i>planned_input_qty</i> .
<b>planned_output_qty</b>	The planned quantity of output parts to be generated by this operation.
<b>planned_output_qty_uom</b>	The Unit of Measure associated with <i>planned_output_qty</i> .
<b>planned_runtime</b>	The planned runtime of this operation.
<b>planned_runtime_uom</b>	The units of measure used for <i>planned_runtime</i> .
<b>planned_start_time</b>	The planned start time for this operation.
<b>planned_start_time_format</b>	Date/time format to use for <i>planned_start_time</i> .
<b>planned_transit_ready_time</b>	The time when the output material from this operation will be ready for transit. This is the planned (or scheduled) ending time for the operation plus the cooldown time for the operation. This value is ignored during input.
<b>planned_transit_ready_time_format</b>	The date and time format to use for <i>planned_transit_ready_time</i> .
<b>primary_output_part</b>	The part number being produced by this manufacturing order.
<b>primary_resource</b>	The primary resource on which <i>operation_id</i> is performed.
<b>priority</b>	This saves out the priority of the operation in cases the user has modified it and would like to retrieve it.
<b>stretched_runtime</b>	The planned runtime of this operation stretched based on resource availability.

### 4.37 Plan\_Resources\_Record

This file is maintained by *Rhythm* for use in saving and restoring plans. Records of this file specify the planned assignment of resources for manufacturing orders. The particular resource used could be any of a number of possible alternate resources or the primary resource.

This file is readable.

Plan_Resources_Record				
Field	Req	Class	Type	Default
mfg_order_id		Name	Name	NULL
operation_id		Name	Name	NULL
resource	U	Resource	Name	
index		Integer	Integer	0
granularity	U	Planning_Granularity	char	

**granularity** The granularity at which this manufacturing order has been planned.  
P means Planner\_Granularity,  
S means Scheduler\_Granularity.

**index** An index into the set of simultaneous resource requirements.  
"0" means machine resource,  
"1" means aux1,  
"2" means aux2, etc.

**mfg\_order\_id** The manufacturing order id having its planned resource defined.

**operation\_id** The operation within a routing for which this manufacturing order applies.

**resource** machine or aux resource but not operators resource. Operators are stored in Plan\_Record.

### 4.38 Priority\_Model\_Record

This file will allow users to specify their own customized priority models.

This file is readable.

Priority_Model_Record				
Field	Req	Class	Type	Default
resource	U	Resource	Name	
priority_component		Name	Name	NULL
coefficient	U	number	number	

**coefficient** This will be the multiplier to the priority\_component in the priority function. User can specify positive (+ve) for addition or (-ve) for subtraction.

**priority\_component** Id of the priority component. Following components are currently available, LPST : PST : ORDER\_PRIORITY : OPR\_PRIORITY :

**resource** The resource having its priority model defined.

### 4.39 Procurement By Part Record

This file is written by *Rhythm* for use by the customer in reading planned procurements.

This file is readable.

Procurement By Part Record				
Field	Req	Class	Type	Default
ordered_part	U	Part_Number	Name	
order_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
order_quantity	U	Part_Quantity	number	
vendor	U	Vendor	Name	
available_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
available_time		Formatted_Time	Formatted_Time	Unknown_Time
needed_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
needed_time		Formatted_Time	Formatted_Time	Unknown_Time
start_of_bucket_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
start_of_bucket		Formatted_Time	Formatted_Time	Unknown_Time
po_release_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
po_release_time		Formatted_Time	Formatted_Time	Unknown_Time

<b>available_time</b>	The available time for this part.
<b>available_time_format</b>	Date/time format to use for available_time.
<b>needed_time</b>	The needed time for this part. This is the planned start time of the manufacturing order's first task's planned start time.
<b>needed_time_format</b>	Date/time format to use for needed_time.
<b>order_quantity</b>	The quantity of parts in units of <i>output_quantity_uom</i> ordered for this demand order.
<b>order_quantity_uom</b>	The Unit of Measure associated with order_quantity.
<b>ordered_part</b>	The demand or manufacturing order directly fed by this procurement. The part number being ordered for this demand order.
<b>po_release_time</b>	The purchase order release time for this part. It is the needed_time minus the vendor lead time.
<b>po_release_time_format</b>	Date/time format to use for po_release_time.
<b>start_of_bucket</b>	The start of bucket for the procurement.
<b>start_of_bucket_format</b>	Date/time format to use for needed_time
<b>vendor</b>	The Vendor Name who supplies this part.

## 4.40 Procurement\_Output\_Record

This file is readable.

Procurement_Output_Record				
Field	Req	Class	Type	Default
demand_order_id	U	Demand_Order	Name	
part_number	U	Part_Number	Name	
quantity_uom		Material_UOM	Name	Material_Quantity_UOM
quantity	U	Part_Quantity	number	
supplier		Name	Name	NULL
time_available_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
time_available		Formatted_Time	Formatted_Time	Unknown_Time
time_needed_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
time_needed		Formatted_Time	Formatted_Time	Unknown_Time

<b>part_number</b>	The part number being procured.
<b>demand_order_id</b>	The name of the order for this procurement.
<b>quantity</b>	The quantity of parts being procured.
<b>quantity_uom</b>	The Unit of Measure associated with quantity.
<b>supplier</b>	The name of the vendor for <i>part_number</i> .
<b>time_available</b>	The date and time when the parts will be available.
<b>time_available_format</b>	Date/time format to use for <i>time_available</i> .
<b>time_needed</b>	The time this order needs this material to complete on time.
<b>time_needed_format</b>	Date/time format to use for <i>time_needed</i> .

## 4.41 Procurement Record

This file is written by *Rhythm* for use by the customer in reading planned procurements.

This file is readable.

Procurement Record				
Field	Req	Class	Type	Default
demand_order_id		Name	Name	NULL
demand_or_mfg_order		Name	Name	NULL
ordered_part	U	Part Number	Name	
order_quantity_uom		Material UOM	Name	Material Quantity UOM
order_quantity	U	Part Quantity	number	
vendor	U	Vendor	Name	
available_time_format		Time Format	Time Format	DDMMYYYYYhhmmss
available_time		Formatted Time	Formatted Time	Unknown Time
needed_time_format		Time Format	Time Format	DDMMYYYYYhhmmss
needed_time		Formatted Time	Formatted Time	Unknown Time
latest_needed_time_format		Time Format	Time Format	DDMMYYYYYhhmmss
latest_needed_time		Formatted Time	Formatted Time	Unknown Time
po_release_time_format		Time Format	Time Format	DDMMYYYYYhhmmss
po_release_time		Formatted Time	Formatted Time	Unknown Time

**available\_time** The available time for this part.

**available\_time\_format** Date/time format to use for available\_time.

**demand\_or\_mfg\_order** The demand or manufacturing order directly fed by this procurement.

**demand\_order\_id** The demand order ultimately fed by this procurement, if mfg order consolidation is not specified. Otherwise this field is blank because potentially many demand orders are ultimately fed by this procurement.

**latest\_needed\_time** The latest needed time for this part. This is the LPST of the first operation of the the manufacturing order producing this part.

**latest\_needed\_time\_format** Date/time format to use for latest\_needed\_time.

**needed\_time** The needed time for this part.

**needed\_time\_format** Date/time format to use for needed\_time.

**order\_quantity** The quantity of parts in units of *output\_quantity\_uom* ordered for this demand order.

**order\_quantity\_uom** The Unit of Measure associated with order\_quantity.

**ordered\_part** The part number being ordered for this demand order.

**po\_release\_time** The purchase order release time for this part. It is the needed\_time minus the vendor lead time.

**po\_release\_time\_format** Date/time format to use for po\_release\_time.

**vendor** The Vendor Name who supplies this part.

## 4.42 Production\_Schedule\_Record

This file is maintained by rhythm to save and restore detail schedules (sequences) at different resources in the factory. Record of this file specifies information that *Rhythm* saves for every job scheduled using detail scheduler within factory.

This file is readable.

Production_Schedule_Record				
Field	Req	Class	Type	Default
resource	U	Resource	Name	
mfg_order_id		Name	Name	NULL
operation_id		Name	Name	NULL
batch_id		Name	Name	NULL
primary_output_part	U	Part_Number	Name	
planned_input_qty_uom	-1	Material_UOM	Name	Material_Quantity_UOM
planned_input_qty	1	Part_Quantity	number	0
planned_output_qty_uom		Material_UOM	Name	Material_Quantity_UOM
planned_output_qty	U	Part_Quantity	number	
planned_start_time_format		Time_Format	Time_Format	DDMMYYYYhhmmss
planned_start_time		Formatted_Time	Formatted_Time	Unknown_Time
planned_end_time_format	-2	Time_Format	Time_Format	DDMMYYYYhhmmss
planned_end_time	2	Formatted_Time	Formatted_Time	Unknown_Time
frozen_flag		Boolean	char	FALSE
scheduler_comments		Name	Name	

**batch\_id** Batch id if the scheduled manufacturing order belongs to batch and the batch is scheduled. Batch will have record for each manufacturing order that belongs to batch.

**frozen\_flag** If True, it means that the PST of the task is locked and is part of the frozen schedule at the given resource. Not yet supported.

**mfg\_order\_id** Manufacturing order id of the scheduled job.

**operation\_id** Operation id of the scheduled job.

**planned\_end\_time** The scheduled end time for this operation (write-only field)

**planned\_end\_time\_format** Date/time format to use for planned\_end\_time (write-only field)

**planned\_input\_qty** Scheduled planned input quantity.

**planned\_input\_qty\_uom** Scheduled planned input quantity uom.

**planned\_output\_qty** Scheduled planned output quantity of the output part.

**planned\_output\_qty\_uom** Scheduled planned output quantity uom.

**planned\_start\_time** The scheduled start time for this operation.

**planned\_start\_time\_format** Date/time format to use for planned\_start\_time.

**primary\_output\_part** Primary output part produced by this manufacturing order.

**resource** Primary resource at which job is scheduled.

**scheduler\_comments** Special comments from the scheduler on the scheduled job.

### 4.43 Random\_Orders\_Record

This record causes *Rhythm* to generate random orders in the system. This can be used to test the system or determine the effect of load on the plant given random orders.

This file is readable.

Random_Orders_Record				
Field	Req	Class	Type	Default
demand_order_id	P	Demand_Order	Name	-Required-
number_of_orders_to_generate	P	Integer	Integer	-Required-
min_due_date_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
min_due_date		Formatted_Time	Formatted_Time	Unknown_Time
max_due_date_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
max_due_date		Formatted_Time	Formatted_Time	Unknown_Time
min_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
min_quantity	U	Part_Quantity	number	
max_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
max_quantity	U	Part_Quantity	number	

**max\_due\_date** The latest due date for a randomly generated order.

**max\_due\_date\_format** Date/time format to use for max\_due\_date.

**max\_quantity** The maximum quantity of a randomly generated order.

**max\_quantity\_uom** The Unit of Measure associated with max\_quantity.

**min\_due\_date** The earliest due date for a randomly generated order.

**min\_due\_date\_format** Date/time format to use for min\_due\_date.

**min\_quantity** The minimum quantity value of a randomly generated order.

**min\_quantity\_uom** The Unit of Measure associated with min\_quantity.

**number\_of\_orders\_to\_generate** The number of random orders to generate.

**demand\_order\_id** An identifier used for the randomly generated order.



#### 4.44 Random\_Unassigned\_Inventory\_Record

Records of this file cause *Rhythm* to generate random unassigned inventory. This can be used to test the system or determine the effect of load given random inventory.

This file is readable.

Random_Unassigned_Inventory_Record				
Field	Req	Class	Type	Default
inventory_buffer	P	Inventory_Buffer	Name	-Required-
part_number	P	Part_Number	Name	-Required-
number_of_records_to_generate	P	Integer	Integer	-Required-
min_material_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
min_part_quantity	U	Part_Quantity	number	
max_material_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
max_part_quantity	U	Part_Quantity	number	
min_arrival_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
min_arrival_time		Formatted_Time	Formatted_Time	Unknown_Time
max_arrival_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
max_arrival_time		Formatted_Time	Formatted_Time	Unknown_Time

**inventory\_buffer** The location where the random inventory will be placed.

**part\_number** The part number for which to generate random unassigned inventory.

**max\_arrival\_time** The latest date to generate randomly. This time represents arrival at "inventory\_buffer".

**max\_arrival\_time\_format** Date/time format to use for max\_arrival\_time.

**max\_part\_quantity** The maximum quantity of *part\_number* to be put in unassigned inventory.

**max\_material\_quantity\_uom** The Unit of Measure associated with max\_material\_quantity.

**min\_arrival\_time** The earliest date to generate randomly. This time represents arrival at "inventory\_buffer".

**min\_arrival\_time\_format** Date/time format to use for min\_arrival\_time.

**min\_part\_quantity** The minimum quantity of *part\_number* to be put in unassigned inventory.

**min\_material\_quantity\_uom** The Unit of Measure associated with min\_material\_quantity.

**number\_of\_records\_to\_generate** The number of records to generate.

#### 4.45 Resource\_Calendar\_Record

Records of this file define resource calendar information as entered in *Rhythm*. This file is generated and maintained only through *Rhythm*. Each record specifies an interval determined by the `start_time_cal` and `end_time_cal` fields, and specifies for that interval the type of capacity determined by the `interval_type` field. This file is readable.

Resource_Calendar_Record				
Field	Req	Class	Type	Default
<code>resource</code>	P	Resource	Name	-Required-
<code>start_time_cal_format</code>	-1	Time_Format	Time_Format	DDMMYYYYhhmmss
<code>start_time_cal</code>	1	Formatted_Time	Formatted_Time	Unknown_Time
<code>end_time_cal_format</code>	-1	Time_Format	Time_Format	DDMMYYYYhhmmss
<code>end_time_cal</code>	1	Formatted_Time	Formatted_Time	Unknown_Time
<code>start_time</code>	2	clockTy	Unsigned	unknown.SECONDS
<code>end_time</code>	2	clockTy	Unsigned	unknown.SECONDS
<code>interval_type</code>		Name	Name	
<code>value</code>		Percentage	number	0

- end\_time** Obsolete way to input `start_time`, kept for compatibility with old data. Will be removed in a future version (after 2.2).
- end\_time\_cal** The end time of the interval specified by this record.
- end\_time\_cal\_format** Date/time format to use for `end_time_cal`.
- interval\_type** textual value specifying the category of calendar information. The possible values are:  
 External\_Type:Theoretical Capacity  
 External\_Type:Unavailable Capacity  
 External\_Type:Planned Maintenance  
 External\_Type:Rework Capacity
- resource** Name of resource having calendar information defined.
- start\_time** Obsolete way to input `start_time`, kept for compatibility with old data. Will be removed in a future version (after 2.2).
- start\_time\_cal** The start time of the interval specified by this record.
- start\_time\_cal\_format** Date/time format to use for `start_time_cal`.
- value** Percentage of the capacity specified by `interval_type` that resource has during this interval. For instance, if `interval_type` is Unavailable Capacity and value is .25, then the resource has .25 unavailable capacity, which means it has .75 of its ordinary capacity within this interval. In this case an operation which would take 75 minutes if the resource was totally available would take 100 minutes if scheduled totally within this interval.  
 For a pooled resource, this number will be interpreted as number of available subresources. For instance, if a pooled operator has ten individual operators, `interval_type` is Unavailable Capacity and value is .4, then there will be six operators available during the interval.

## 4.46 Resource Layout Record

This file supports the graphical layout of resources in the main window.

This file is readable.

Resource Layout Record				
Field	Req	Class	Type	Default
resource	P	Resource	Name	-Required-
x	P	Integer	Integer	-Required-
y	P	Integer	Integer	-Required-
width	P	Integer	Integer	-Required-
height	P	Integer	Integer	-Required-

**height** The height of this resource's graphical representation.

**resource** A unique identifier for this resource.

**width** The width of this resource's graphical representation.

**x** The horizontal position of this resource in its location. X values increase from left to right.

**y** The vertical position of this resource in its location. Y values increase from top to bottom.

## 4.47 Resource\_Lock\_Record

Store bucket lock information. The stored date indicate all buckets before and including that time will be locked when the server is restarted.

This file is readable.

Resource_Lock_Record				
Field	Req	Class	Type	Default
resource	P	Resource	Name	-Required-
lock_horizon_format	-1	Time_Format	Time_Format	DDMMYYYYYhhmmss
lock_horizon	1	Formatted_Time	Formatted_Time	Unknown_Time

**lock\_horizon** The time in before which all buckets are locked.

**lock\_horizon\_format** Date/time format to use for start\_time\_cal.

**resource** Name of resource with locked buckets

<b>batch_capacity_uom</b>	This field is obsolete and should not be used.
<b>batching_horizon</b>	The amount of time before and after a PST used to determine whether other jobs with similar materials can be grouped with the job currently being considered for scheduling as a batch.
<b>batching_horizon_uom</b>	The units used for <i>batching_horizon</i> .
<b>batching_lookahead</b>	The time frame into which the automated batching should look to find tasks to pull for creating a batch. In other words, how far in advance of a PST should <i>Rhythm</i> look to find tasks to contribute to a batch. Orders will not be pulled from beyond the horizon if lookahead exceeds the horizon and a batch near the end of the horizon is not yet full.
<b>batching_lookahead_uom</b>	The units used for <i>batching_lookahead</i> .
<b>default_setup_time</b>	The time to setup from and source setup type to any destination setup type not specified in the file containing records of <i>Sequence-Dependent-Setup-Time-Record</i> .
<b>default_setup_time_uom</b>	The units used for <i>default_setup_time</i> .
<b>estimated_queue_time</b>	The estimated time parts wait in queue before being processed by this resource.
<b>estimated_queue_time_uom</b>	The time units used for the estimated queue time.
<b>ideal_utilization_level</b>	the ideal utilization that the resource must try to reach in each <i>capacity_model</i> bucket
<b>last_refurbish_date</b>	The date this resource was last refurbished (had preventive maintenance applied to it). This field is currently not used.
<b>last_refurbish_date_format</b>	Date/time format to use for <i>last_refurbish_date</i> .
<b>lateness_tolerance</b>	The amount of time for determining whether an order is late/early/on time in the <i>By Lateness</i> representation of the load graph. If the PST is greater than the LPST + tolerance, then the order is late. If the PST is less than the LPST - tolerance, then the order is early.
<b>lateness_tolerance_uom</b>	The units used for defining lateness tolerance
<b>lifetime</b>	The MTBF. This field is currently not used.
<b>lifetime_uom</b>	The units used for <i>lifetime</i> . This field is currently not used.
<b>location</b>	The location of this resource in the factory for fixed location resources.
<b>maximum_utilization_level</b>	the maximum utilization that the resource can reach in each <i>capacity_model</i> bucket
<b>minimum_queue_time</b>	The minimum time parts wait in queue before being processed by this resource. The value must be less than or equal to the estimated queue time. If -1 (the default), <i>minimum_queue_time</i> defaults to the value of <i>estimated_queue_time</i> .
<b>minimum_queue_time_uom</b>	The time units used for the minimum queue time.
<b>minimum_utilization_level</b>	the minimum utilization that the resource can reach in each <i>capacity_model</i> bucket

<b>model_name</b>	Aggregate_Resource to create an aggregate resource, Sub_Resource to create a subresource. Other values are ignored and an ordinary resource is created unless <b>number_of_pooled_resources</b> is greater than 1.
<b>name</b>	A unique identifier for this resource.
<b>number_of_pooled_resources</b>	If this number is greater than 1, then this resource will be created as a pooled resource consisting of this number of subresources.
<b>offloadable_from_p</b>	True if resource should be considered for automated offloading.
<b>offloadable_to_p</b>	if True other resources can offload to this resource.
<b>refurbish_time</b>	The amount of time since this resource was last refurbished (preventive maintenance). This field is currently not used.
<b>refurbish_time_uom</b>	The units used for <i>refurbish_time</i> . This field is currently not used.
<b>setup_matrix_id</b>	The name of the matrix used by this resource to determine sequence dependent setup information. This name is defined in the file containing records of <i>Sequence_Dependent_Setup_Time_Record</i> .

## 4.49 Routing Record

Each record of the file specifies a routing. Each record defines the next *operation* in the sequence of operations for a *routing*. It also specifies routing related times for this operation (runtime, preop time, and cooldown time). These times can be modified when the operation runs on particular resources via the file containing records of *Operation\_Resources\_Record*.

Note: some assembly customer databases might not have routing ids if each part number is produced by only one routing. These applications should pass the part number id itself as *routing*.

This file is readable.

Routing Record				
Field	Req	Class	Type	Default
routing	P	Name	Name	-Required-
operation	P	Name	Name	-Required-
preop_time_uom	1	Unit_Of_Measure	Name	BLANK_UOM
preop_time	1	Scalar_Time	number	0
unit_runtime_uom	2	Unit_Of_Measure	Name	BLANK_UOM
unit_runtime	2	Scalar_Time	number	0
run_rate_uom	3	Material_UOM	Name	Material_Quantity_UOM
run_rate_per	3	Unit_Of_Measure	Name	BLANK_UOM
run_rate	3	Part_Quantity	number	0
base_yield		Percentage	number	1.0
cooldown_time_uom	4	Unit_Of_Measure	Name	BLANK_UOM
cooldown_time	4	Scalar_Time	number	0
part_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
transfer_batch_quantity		Part_Quantity	number	MATERIAL_QUANTITY_UNINITIALIZED
sequence_dependent_setup_type		SD_Setup_Type	Name	0
primary	5	Batch_Type	Name	0
secondary1	-5	Batch_Type	Name	0
secondary2	-5	Batch_Type	Name	0
secondary3	-5	Batch_Type	Name	0
base_machine_resource		Resource	Name	NULL
priority		Integer	Integer	unknown.INT
acm_flag		ACM_Flag	char	ACM_Add
link_downstream_p		Boolean	char	FALSE

**acm\_flag** Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or ". Blank and nothing at all default to Add.

**base\_machine\_resource** If this routing uses a single resource, you can specify it here. This is a convenience feature so some customers can avoid the more general *operation\_resources\_data* file.

**base\_yield** Defines the expected yield of this operation. If there is an expected spoilage of 3%, then *base\_yield* would be "0.97".

**cooldown\_time** Specifies the time material sits after runtime. The amount of time is independent of the quantity of parts.

**cooldown\_time\_uom** The units used for *cooldown\_time*.

<b>link_downstream_p</b>	The <i>link_downstream_p</i> field indicates if this operation is linked to the following operation in this routing. If this value is <i>TRUE</i> then Rhythm will always propagate the planned times to the following operation to prevent any time gap between the two operations.
<b>part_quantity_uom</b>	The Unit of Measure associated with <i>material_quantity</i> .
<b>operation</b>	An operation in the operation sequence for <i>routing</i> .
<b>primary</b>	The primary batch type for this operation.
<b>priority</b>	This allows users to give priority to a particular routing and operation. CAO will use it in pull-push logic.
<b>routing</b>	The name of a routing which includes this <i>operation</i> . This routing id will be used by records of <i>Bill_Of_Materials_Records</i> to define where material is used when producing parts.
<b>run_rate</b>	Continuous flow processes use <i>run_rate</i> INSTEAD OF <i>unit_runtime</i> . <i>run_rate</i> is in terms of quantity / time. For example, 39 Tons per hour, or 19 liters per minute. The unit of measure (e.g. Tons or Liters) is specified with <i>run_rate_uom</i> field. The time unit of measure (e.g. hours or minutes) is in the <i>run_rate_per</i> field.
<b>run_rate_per</b>	A Unit of Measure associated with <i>run_rate</i> . E.g. in 19 liters per minute, this value would be "MINUTES".
<b>run_rate_uom</b>	A Unit of Measure associated with <i>run_rate</i> . E.g in 19 liters per minute, this value would be "LITERS".
<b>secondary1</b>	An alternate batch type for this operation.
<b>secondary2</b>	An alternate batch type for this operation.
<b>secondary3</b>	An alternate batch type for this operation.
<b>sequence_dependent_setup_type</b>	The type this routing puts this resource into after performing this operation. For example, a painting machine may put this resource into a state of "WHITE" or "BLACK" which is used in a setup matrix to specify sequence dependent setup time from type "WHITE" to "BLACK" and vice versa. If no type is input, then the type is set to a concatenation of operation and part. This field has meaning only if a setup matrix has been established.
<b>transfer_batch_quantity</b>	Transfer batch quantity for the operation.
<b>preop_time</b>	The amount of time materials occupy the resource before runtime. The amount of time is independent of the quantity of parts. However, if there are no input parts, this amount of time is ignored.
<b>preop_time_uom</b>	The units used for <i>preop_time</i> .
<b>unit_runtime</b>	Specifies the runtime per unit of <i>consumed_part_number</i> specified in the file containing records of <i>Bill_Of_Materials_Record</i> . For instance, if operation "Assemble_Table" requires "8" "legs" and "2" "table_top" and <i>unit_runtime</i> and <i>unit_runtime_uom</i> are "1" "HOURS" to produce 2 tables, and we plan an order for three tables (12 legs and 3 table_tops), the total runtime of the operation is 1.5 hours.
<b>unit_runtime_uom</b>	the unit of measure for <i>unit_runtime</i> .



## 4.50 Sequence\_Dependent\_Setup\_Time\_Record

Each record specifies the sequence dependent setup time for changing a resource from processing operations of one type to operations of another type.

A matrix is used to define a set of setup times. A resource relies on a particular setup matrix. Any vertices left undefined in the setup matrix default to a value specified in a record of type *Resource\_Record* associated with the particular resource.

This file is readable.

Sequence_Dependent_Setup_Time_Record				
Field	Req	Class	Type	Default
setup_matrix_id	P	Setup_Matrix	Name	-Required-
sequence_dependent_setup_type_from		SD_Setup_Type	Name	UNKNOWN_SETUP_TYPE
sequence_dependent_setup_type_to		SD_Setup_Type	Name	UNKNOWN_SETUP_TYPE
setup_time_uom	1	Unit_Of_Measure	Name	BLANK_UOM
setup_time	1	Scalar_Time	number	0

**sequence\_dependent\_setup\_type\_from** The name of a source setup type, e.g. "green paint".

**sequence\_dependent\_setup\_type\_to** The name of a destination setup type, e.g. "purple paint". It is an error when this field is the same as *sequence\_dependent\_setup\_type\_from*.

**setup\_matrix\_id** The name of a setup matrix. This name is referenced by different resources via the file containing records of type *Resource\_Record*.

**setup\_time** The time it takes to setup if a routing previously left a resource in a state of *sequence\_dependent\_setup\_type\_from* and now needs to change to *sequence\_dependent\_setup\_type\_to*.

**setup\_time\_uom** The units used for "setup\_time".

### 4.51 Shift\_Record

Records of this file define shift information that is read into *Rhythm*.

This file is readable.

Shift_Record				
Field	Req	Class	Type	Default
location		String		NULL
shift_id	P	String		-Required-
start_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
start_time		Formatted_Time	Formatted_Time	Unknown_Time
end_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
end_time		Formatted_Time	Formatted_Time	Unknown_Time

**end\_time** The end time for the shift.

**end\_time\_format** Date/time format to use for end\_time.

**location** location where this shift is valid. If location is not specified - this shift is assumed to be a globally defined shift valid for all locations.

**shift\_id** id to identify the shift.

**start\_time** The start time for the shift.

**start\_time\_format** Date/time format to use for start\_time.

## 4.52 Short\_Late\_Orders\_Record

This file contains a list of short and late orders in the plan generated by *Rhythm*.

This file is readable.

Short_Late_Orders_Record				
Field	Req	Class	Type	Default
demand_order_id		Name	Name	NULL
type		Pruned_String	Pruned_String	NULL
part_number	U	Part_Number	Name	
order_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
order_quantity	U	Part_Quantity	number	
available_time_format		Time_Format	Time_Format	DDMMYYYYhhmmss
available_time		Formatted_Time	Formatted_Time	Unknown_Time
amount_late_uom		Unit_Of_Measure	Name	BLANK_UOM
amount_late		Scalar_Time	number	0
reason		Pruned_String	Pruned_String	NULL

<b>amount_late</b>	The amount by which the order is late.
<b>amount_late_uom</b>	The time unit of measure in which the <i>amount_late</i> is specified.
<b>available_time</b>	The time the order is completed.
<b>available_time_format</b>	Date/time format to use for <i>available_time</i> .
<b>demand_order_id</b>	The name of the demand order.
<b>part_number</b>	The part being produced by this demand order.
<b>order_quantity</b>	The quantity of parts in units of <i>output_quantity_uom</i> ordered for this demand order.
<b>order_quantity_uom</b>	The Unit of Measure associated with <i>order_quantity</i> .
<b>reason</b>	
<b>type</b>	<i>SHORT</i> for reporting short orders, and <i>LATE</i> for reporting late orders.

### 4.53 Super\_Order\_Mapping\_Record

This record contains a record of all the demand order splits that have been done in *Rhythm*. This file will enable *Rhythm* to recreate the splits while reading in a saved plan.

This file is readable.

Super_Order_Mapping_Record				
Field	Req	Class	Type	Default
super_order		Name	Name	NULL
sub_order		Name	Name	NULL
sub_order_qty	U	Part Quantity	number	

**sub\_order** One of many split orders.

**sub\_order\_qty** Output quantity of the split sub-order.

**super\_order** When an order is split, a super order is created in *Rhythm*. It keeps track of all the split sub-orders.

## 4.54 Supplier\_Part\_Record

Records of this file are used to define fixed lead times for parts obtained from vendors. For a specific vendor, lead times for each part number can be defined. Multiple vendors can be defined for a part, in which case the vendor with the earliest lead time will be selected.

This file is readable.

Supplier_Part_Record				
Field	Req	Class	Type	Default
vendor	P	Vendor	Name	-Required-
part_number	P	Vendor_Part	Name	-Required-
lead_time_uom		Unit_Of_Measure	Name	BLANK_UOM
lead_time		Scalar_Time	number	0
cost		Money	number	0
cost_uom		Unit_Of_Measure	Name	BLANK_UOM
min_quantity_uom		Material_UOM	Name	Material_Quantity_UO
min_quantity		Part_Quantity	number	0
part_quantity_uom		Material_UOM	Name	Material_Quantity_UO
max_quantity		Vendor_Max_Quantity	Vendor_Max_Quantity	Infinity
min_lot_size		Procurement_Min_Lot_Size	Procurement_Min_Lot_Size	0
max_lot_size		Procurement_Max_Lot_Size	Procurement_Max_Lot_Size	Infinity
inc_lot_size		Procurement_Inc_Lot_Size	Procurement_Inc_Lot_Size	1
procurement_time_uom		Unit_Of_Measure	Name	BLANK_UOM
procurement_time		Scalar_Time	number	604800
procurement_horizon_uom		Unit_Of_Measure	Name	BLANK_UOM
procurement_horizon		Scalar_Time	number	SCALAR_TIME_MAX
vendor_part		Name	Name	
count		Integer	Integer	1

**cost** Unused

**cost\_uom** Unused

**count** Number of times "max\_quantity" will be purchased.

**inc\_lot\_size** if the number of units required for a part falls between minimum and maximum lot size after an initial order has been placed then procurement has to be done in increments of inc\_lot\_size.

**lead\_time** The normal or expected lead time for this part.

**lead\_time\_uom** A Unit Of Measure specifies a conversion from some external unit to the internal units used by Rhythm. For example, Rhythm stores all times as seconds. The *days* unit of measure converts days to seconds, while the *hours* unit of measure converts hours to seconds. The default (blank) unit of measure multiplies all values by one.

**part\_quantity\_uom** The material quantity unit of measure in which *material\_quantity\_uom* is specified.

**part\_number** The part this vendor can supply. If the value is set to ALL\_RAW\_MATERIALS, then this record applies to all raw parts in the system. Raw parts are those parts which have no means of being produced (no BOM produces them). This value is used for doing

	demons when lead times are not available.
<b>max_lot_size</b>	The maximum quantity of parts that this vendor will supply for a part at a time. If more units of this part are required - the vendor will have to order in multiples of max lot size and min lot size.
<b>max_quantity</b>	The maximum number of parts a vendor can supply within the defined <i>lead_time</i> . If left blank, there is no limit on the number of parts a vendor can supply within the given lead time.
<b>min_lot_size</b>	The minimum lot size that this vendor will supply for procurement of a part. The user has to order at least this many units of this part at least for first time time procurement. If the remaining quantity falls within min lot size and max lot size the user will be supplied parts in increments of inc_lot_size.
<b>min_quantity</b>	Unused
<b>min_quantity_uom</b>	The Unit of Measure associated with min_quantity.
<b>procurement_horizon</b>	the horizon beyond which procurement lot sizing is not done.
<b>procurement_horizon_uom</b>	A Unit Of Measure specifies a conversion from some external unit to the internal units used by Rhythm. For example, Rhythm stores all times as seconds. The <i>days</i> unit of measure converts days to seconds, while the <i>hours</i> unit of measure converts hours to seconds. The default (blank) unit of measure multiplies all values by one.
<b>procurement_time</b>	The horizon or time interval over which procurement lot sizing is done.
<b>procurement_time_uom</b>	A Unit Of Measure specifies a conversion from some external unit to the internal units used by Rhythm. For example, Rhythm stores all times as seconds. The <i>days</i> unit of measure converts days to seconds, while the <i>hours</i> unit of measure converts hours to seconds. The default (blank) unit of measure multiplies all values by one.
<b>vendor</b>	The name of the vendor for this <i>part_number</i> . When <i>Rhythm</i> Interplant functionality is used via <i>Supplier_Record</i> , <i>vendor</i> can be an Interplant plant name supplying <i>part_number</i> to this plant.
<b>vendor_part</b>	<i>Vendor</i> 's name for <i>part_number</i> . This field defaults to <i>part_number</i> when blank, meaning <i>vendor</i> and this <i>Rhythm</i> server both call the part by the same name. This feature is currently only relevant when <i>Rhythm</i> Interplant functionality is used.

## 4.55 Supplier\_Record

This file identifies the Interplant suppliers among the part vendors specified in *Supplier\_Part\_Record*s. An Interplant supplier is a *Rhythm* server in a network of servers connected by Interplant data files which feed each other demands and respond to each other with part reservations. This file also contains one record which specifies the name of *this Rhythm* server as an Interplant consumer (and possibly supplier). It is an error to leave out this record if any Interplant suppliers are specified.

This file is readable.

Supplier_Record				
Field	Req	Class	Type	Default
supplier	P	Name	Name	-Required-
type	P	Name	Name	-Required-
data_directory		Pruned_String	Pruned_String	

**data\_directory** When the *type* field is *INTERPLANT* or *SELF* this field is a string providing the path to the data directory for *supplier*'s *rhythm\_server*. When *type* is *SELF*, *data\_directory* defaults to *DIR/* where *DIR* is determined by the *-dir* command line option. When *type* is *INTERPLANT*, *data\_directory* defaults to *DIR/./SUPPLIER/* where *DIR* is the *data\_directory* for the *SELF* record and *SUPPLIER* is the *supplier* field of the file. Note that the pathname supplied should have a trailing */*.

**supplier** The meaning of this field is determined by the *type* field. If *type* is *SELF*, *supplier* is the name of this *Rhythm* server (plant) in the Interplant network. If *type* is *INTERPLANT*, *supplier* is the name of another *Rhythm* server (plant) in the Interplant network which can supply this server parts specified in *supplier\_part\_data*. Part demands and responses are communicated through Interplant data files. If *type* is *VENDOR*, *supplier* is an external (non-Interplant) vendor supplying parts specified in *supplier\_part\_data* (currently such records are ignored).

**type** One of the strings *INTERPLANT*, *SELF* or *VENDOR*. Each value specifies a different interpretation for the *vendor* field. If any *INTERPLANT* records occur in the file, one record must be of type *SELF*.

## 4.56 Transportation\_Time\_Record

Each record specifies the time it takes to transport parts from *from\_location* to *to\_location*. Transportation times are a critical factor determining the time between each planned operation.

This file is readable.

Transportation_Time_Record				
Field	Req	Class	Type	Default
part_number		Name	Name	NULL
from_location	P	Location	Name	-Required-
to_location	P	Location	Name	-Required-
transportation_time_uom	P	Unit_Of_Measure	Name	-Required-
transportation_time	P	Scalar_Time	number	-Required-

**from\_location** A location, commonly defined in the file containing records of *Resource\_Record*. This is the source location.

**part\_number** The name of a part for this particular transportation time. If this part is left blank, the default transportation time between *from\_location* and *to\_location* is defined. If certain parts require additional transportation between the same two locations, another record with a part number is defined, overriding the default transportation time. This field is currently not used.

**to\_location** A location, commonly defined in file containing records of *Resource\_Record*. This is the destination location.

**transportation\_time** The time transportation of material takes between *from\_location* and *to\_location*. This only defines the time in the forward direction. For example, if *from\_location* is A and *to\_location* is B, the time from A — B is defined, but the time from B — A is not defined (and is therefore zero).

**transportation\_time\_uom** The time units used for *transportation\_time*.



## 4.57 Unassigned Inventory Record

Each record specifies a quantity of a part not yet assigned to any demand orders or manufacturing orders. These parts are available for *Rhythm* to assign to demand orders and manufacturing orders. They contrast with the parts specified in *wip\_data* which are parts already assigned to orders, and parts in *vendor\_data* which can be procured from vendors.

This file is readable.

Unassigned Inventory Record				
Field	Req	Class	Type	Default
inventory_buffer		Inventory_Buffer	Name	unspecified_inventory_buffer_id
part_number	P	Part_Number	Name	-Required-
part_quantity_uom		Material_UOM	Name	Material_Quantity_UOM
part_quantity		Vendor_Max_Quantity	Vendor_Max_Quantity	Infinity
purchase_order_number	1	Name	Name	NULL
vendor	-1	Vendor	Name	NULL
arrival_time_format		Time_Format	Time_Format	DDMMYYYYYhhmmss
arrival_time		Formatted_Time	Formatted_Time	Unknown_Time

**arrival\_time** The time at which this part will be available in *inventory\_buffer* . If blank, which is normally the case for at least one record of the file, this field defaults to the current time.

**arrival\_time\_format** The date/time format to use in parsing *arrival\_time* .

**inventory\_buffer** The holding queue in which this part is sitting. If left blank it defaults to the buffer specified by command line option *-unspecified\_inventory\_buffer\_id*.

**part\_quantity** The total quantity of *part\_number* that is either already present, or will arrive at *arrival\_time* . If left blank, the quantity is infinite.

**part\_quantity\_uom** The unit of measure in which *part\_quantity* is specified.

**part\_number** The part number for the quantity of unassigned parts that are being specified.

**purchase\_order\_number** An identifier for the purchase order associated with this part arrival.

**vendor** The name of the vendor (provider) for this unassigned part.

## 4.58 Unassigned\_Wip\_Record

This file is used to specify parts in process on the shop floor which are not assigned to manufacturing orders. *Rhythm* will make such assignments. The format is similar to Wip\_Record. However, instead of referencing a manufacturing order, several of the fields identify the particular bill of material, routing, and operation processing the parts.

This file is readable.

Unassigned_Wip_Record				
Field	Req	Class	Type	Default
routing	P	Routing	Name	-Required-
produced_part	P	Part_Number	Name	-Required-
operation	P	Name	Name	-Required-
ecn_date_format		Time_Format	Time_Format	DDMMYYYYhhmmss
ecn_date		Formatted_Time	Formatted_Time	Unknown_Time
unfinished_part	1	Part_Number	Name	NULL
unfinished_part_quantity_uom	-1	Material_UOM	Name	Material_Quantity_UOM
unfinished_part_quantity	-1	Part_Quantity	number	0
finished_part	2	Part_Number	Name	NULL
finished_part_quantity_uom	-2	Material_UOM	Name	Material_Quantity_UOM
finished_part_quantity	-2	Part_Quantity	number	0

**ecn\_date** The effective date of the bill of material producing the unassigned wip. Usually the effective date is *current time*, represented by a blank.

**ecn\_date\_format** Date/time format to use for ecn\_date.

**finished\_part** The output part of this operation, usually identical to produced\_part.

**finished\_part\_quantity** The unassigned wip quantity of *finished\_part* currently located after this operation. This quantity has not yet moved to downstream operations.

**finished\_part\_quantity\_uom** The Unit of Measure associated with finished\_part\_quantity

**operation** The operation within the routing where this unassigned wip is located.

**produced\_part** The bill of material output part, usually identical to finished\_part.

**routing** The routing currently processing this unassigned wip.

**unfinished\_part** An input part of this operation.

**unfinished\_part\_quantity** The unassigned wip quantity of *unfinished\_part* currently located in front of this operation.

**unfinished\_part\_quantity\_uom** The Unit of Measure associated with unfinished\_part\_quantity.

### 4.59 Unit\_Of\_Measure\_Record

Defines new units of measure and conversion factors between units of measure. Built-in types include "Material\_Quantity", "Money", "Space", and "Scalar\_Time". All conversions must ultimately be anchored in a built-in type. Additional built-in types include "WEEKS", "DAYS", "HOURS", "MINUTES" and "SECONDS".

Units of Measure are reflexive and transitive. This means that defining a conversion from minutes to seconds automatically defines the conversion from seconds to minutes. It also means that defining conversions from minutes to seconds and hours to minutes automatically defines a conversion from hours to seconds.

This file is readable.

Unit_Of_Measure_Record				
Field	Req	Class	Type	Default
part		Part_Number	Name	NULL
from_uom	P	Name	Name	-Required-
to_uom	P	Name	Name	-Required-
conversion	P	number	number	-Required-

**conversion** Conversion factor from *from\_uom* to *to\_uom*. E.g. "24".

**from\_uom** Name of a unit to convert from. E.g. "DAYS".

**part** Part number associated with the unit of measure

**to\_uom** Name of a unit to convert to. E.g. "HOURS".

## 4.60 Use\_Effectivity\_Mutations\_Record

This file is maintained by *Rhythm* for use in saving and restoring plans. *Rhythm* replaces any Use-Up and Accompanying Parts having the *ecn\_number* for this record with any Replacement Parts having the *ecn\_number* for this record. For instance, a given BOM might specify an *ecn\_number* of 100 with Use-Up Parts 10 and 11. Accompanying Part 12. and Replacement Parts 13, 14, and 15. It could also specify an *ecn\_number* of 101 with Use-Up Part 20, no Accompanying Parts, and Replacement Part 21. If *Rhythm* runs out of part 10, it replaces demand for 10, 11, and 12 with parts 13, 14, and 15. Later, if it runs out of part 20, it starts using 21 instead.

This file is output by *Rhythm*. The *unmutated\_portion* is the percentage of parts used as Use-Up Parts. The remaining percentage is those parts used as Replacement Parts.

This file is readable.

Use_Effectivity_Mutations_Record				
Field	Req	Class	Type	Default
mfg_order	P	Manufacturing_Order	Name	-Required-
ecn_number	P	String		-Required-
unmutated_portion	P	number	number	-Required-

**ecn\_number** The tag which binds sets of Use-Up, Accompanying, and Replacement Parts (see *ecn\_code* ). For a given *ecn\_number* , its Use-Up and Accompanying Parts are replaced by the Replacement Parts. See *BillOfMaterials\_Record* .

**mfg\_order** A unique id used to identify a particular manufacturing order.

**unmutated\_portion** Percentage of parts used as Use-Up Parts.

### 4.61 Variable\_Capacity\_Bucket\_Size\_Record

This record allows the definition of variable sized time buckets used for rough scheduling purposes and many graphical display elements (e.g. load graphs). The overall scheduling horizon is affected by the size of buckets defined and the number of each bucket size defined.

This file is readable.

Variable_Capacity_Bucket_Size_Record				
Field	Req	Class	Type	Default
bucket_size_uom	P	Unit_Of_Measure	Name	-Required-
bucket_size	P	Scalar_Time	number	-Required-
number_of_buckets_of_given_size		Integer	Integer	1
rollover_period_uom	1	Unit_Of_Measure	Name	BLANK_UOM
rollover_period	1	Scalar_Time	number	0

**bucket\_size** The number of buckets of size *bucket\_size\_uom* .

**bucket\_size\_uom** The units used for *bucket\_size* .

**number\_of\_buckets\_of\_given\_size** The total number of buckets of the defined size.

**rollover\_period** The period of time between refreshes of the capacity bucket sizes. For instance, if have 7 DAY buckets and 12 WEEK buckets and rollover period is one week, then as the planner advances time, it chops off the 7 day buckets until one week (7 day buckets) is gone. Then it will generate a fresh set of 7 day buckets and 12 week buckets.

**rollover\_period\_uom** A Unit Of Measure specifies a conversion from some external unit to the internal units used by Rhythm. For example, Rhythm stores all times as seconds. The *days* unit of measure converts days to seconds, while the *hours* unit of measure converts hours to seconds. The default (blank) unit of measure multiplies all values by one.

## 4.62 Wip\_Assignments\_Output\_Record

This file is used to output *Rhythm*'s assignments of unassigned\_wip\_data to manufacturing orders. To make the assignments persist between runs, use the report to convert records of unassigned\_wip\_data into wip\_data. The file does not include assignments specified to *Rhythm* through file wip\_data.

This file is readable.

Wip_Assignments_Output_Record				
Field	Req	Class	Type	Default
manufacturing_order	U	Manufacturing_Order	Name	
operation		Name	Name	NULL
unfinished_part		Part_Number	Name	NULL
unfinished_part_uom		Material_UOM	Name	Material_Quantity_UOM
unfinished_part_quantity		Part_Quantity	number	0
finished_part		Part_Number	Name	NULL
finished_part_uom		Material_UOM	Name	Material_Quantity_UOM
finished_part_quantity		Part_Quantity	number	0

**finished\_part** An output part of the operation.

**finished\_part\_quantity** The quantity of *finished\_part* located after the operation and assigned to *manufacturing\_order*.

**finished\_part\_uom** The Unit of Measure associated with finished\_part\_quantity.

**manufacturing\_order** The manufacturing order which received the wip assignments.

**operation** The operation within the routing where the wip is assigned.

**unfinished\_part** An input part of the operation.

**unfinished\_part\_quantity** The quantity of *unfinished\_part* in front of the operation and assigned to *manufacturing\_order*.

**unfinished\_part\_uom** The Unit of Measure associated with unfinished\_part\_quantity.

### 4.63 Wip\_Record

This file is used to specify parts on the shop floor which are assigned to a given manufacturing order. It is also used to specify when an operation of a given manufacturing order is complete.

For this release of the software, *unfinished\_inventory\_buffer* and *finished\_inventory\_buffer* should be blank, specifying a global *default\_buffer*.

*unfinished\_part\_number* and *unfinished\_quantity* specify parts not yet processed by *operation*. *finished\_part\_number* and *finished\_quantity* specify parts already processed by *operation* but not yet transported to the next operation. If both are zero, there is no reason to supply the record unless you want to mark *operation\_complete\_p* as being true.

Since a given operation can have several input parts, several records for a given pair of *manufacturing\_order* and *operation* can occur.

Some users will have trouble reporting *unfinished\_quantity* but can report them in terms of finished parts. For instance, if the operation input part quantities are "1" "PartA" and "2" "PartB" and the output part quantities are "1" "PartC", the user might not be able to report that a manufacturing order has unfinished "10" "PartA" and unfinished "20" "PartB" at the first operation. Instead, the user can report these in terms of output part "PartC" by saying that the first operation has "10" unfinished "PartC"'s.

This file is readable.

Wip_Record				
Field	Req	Class	Type	Default
manufacturing_order	P	Name	Name	-Required-
operation	P	Name	Name	-Required-
operation_sequence_number		Integer	Integer	-1
specific_routing_id		Part_Number	Name	NULL
unfinished_part_number	1	Part_Number	Name	NULL
unfinished_quantity_uom	-1	Material_UOM	Name	Material_Quantity_UOM
unfinished_quantity	-1	Part_Quantity	number	0
unfinished_inventory_buffer	-1	Inventory_Buffer	Name	unspecified_inventory_buffer_id
finished_part_number	2	Part_Number	Name	NULL
finished_quantity_uom	-2	Material_UOM	Name	Material_Quantity_UOM
finished_quantity	-2	Part_Quantity	number	0
finished_inventory_buffer	-2	Inventory_Buffer	Name	unspecified_inventory_buffer_id
start_time_format	-3	Time_Format	Time_Format	DDMMYYYYYYhhmmss
start_time	3	Formatted_Time	Formatted_Time	Unknown_Time
elapsed_runtime_uom	-4	Unit_Of_Measure	Name	BLANK_UOM
elapsed_runtime	4	Scalar_Time	number	unknown.FLOAT
completion_time_format		Time_Format	Time_Format	DDMMYYYYYYhhmmss
completion_time		Formatted_Time	Formatted_Time	Unknown_Time
operation_complete_p		Boolean	char	FALSE
processed_quantity	-2	Part_Quantity	number	0
acm_flag		ACM_Flag	char	ACM_Add

**acm\_flag** Add Cancel Modify flag is a single character field containing one of the characters "A" "C" "M" or ". Blank and nothing at all default to Add.

**completion\_time** The time this WIP was complete.

**completion\_time\_format** Date/time format to use for completion\_time.

<b>elapsed_runtime</b>	The elapsed runtime that should be consumed from the operation runtime. Users can specify either <i>elapsed_runtime</i> or <i>start_time</i> . If <i>start_time</i> is specified <i>elapsed_runtime</i> is calculated to be $elapsed\_runtime = planner\_current\_time - start\_time$ .
<b>elapsed_runtime_uom</b>	The time unit of measure in which the <i>elapsed_runtime</i> is specified.
<b>finished_inventory_buffer</b>	The location where <i>finished_part_number</i> is located. This field is currently unused.
<b>finished_quantity</b>	The quantity of <i>finished_part_number</i> produced and located after this operation on the shop floor at the time this record is read by <i>Rhythm</i> .
<b>finished_quantity_uom</b>	The Unit of Measure associated with finished-material-quantity
<b>finished_part_number</b>	The part number produced at this operation by this manufacturing order.
<b>manufacturing_order</b>	The unique manufacturing order id used to associate this WIP with a particular demand order.
<b>operation</b>	The operation where this WIP is at within a particular routing.
<b>operation_complete_p</b>	A flag defining whether this WIP is complete or not. A "T" here means the specified operation of the manufacturing order has been processed. An "F" means the specified operation of the manufacturing order is not finished yet.
<b>operation_sequence_number</b>	This field is obsolete.
<b>processed_quantity</b>	The total quantity of <i>finished_part_number</i> this operation has ever completed. This does not describe inventory currently positioned after the operation. It is a historical total. This data is used mostly for display purposes. However, at the last operation of a final assembly manufacturing order, the quantity is treated as additional shippable parts. This helps in two wip reporting scenarios: 1. customers who report only unfinished-quantity and processed-quantity. If they do not have a way of reporting finished-quantity at the last operation, the processed-quantity at the last operation will cover reporting of the finished goods. 2. customers who ship out the finished goods in batches (e.g. truckloads). They can utilize both finished-quantity and processed-quantity. Before any goods are shipped, finished-quantity holds the total quantity. As they ship portions, they can move quantities from finished-quantity to processed-quantity. Without doing this, <i>Rhythm</i> would treat such orders are short and would try to fix the shortages.
<b>specific_routing_id</b>	obsolete field
<b>start_time</b>	The time this WIP was started. Users can either specify <i>start_time</i> or the <i>elapsed_runtime</i> . If <i>elapsed_time</i> is specified the <i>start_time</i> is assumed to be $start\_time = planner\_current\_time - elapsed\_time$ .
<b>start_time_format</b>	Date/time format to use for start.time.
<b>unfinished_inventory_buffer</b>	The location of the <i>unfinished_part_number</i> . This field is currently unused.
<b>unfinished_quantity</b>	The quantity of <i>unfinished_material_type</i> yet to be processed.



**unfinished\_quantity\_uom** The Unit of Measure associated with unfinished\_material\_quantity  
**unfinished\_part\_number** A part waiting to be processed at this operation.

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